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Essays on the Economics of Immigration: Economic Assimilation, Labor Market Effect, and Selective Out-migration in Korea

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Abstract

Essays on the Economics of Immigration: Economic Assimilation, Labor Market Effect, and Selective Out-migration in Korea

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The collection of essays studies three critical issues in immigration economics: Economic Assimilation, Labor Market Effect, and Selective Out-migration in Korea. We provide the first reliable evidence on each topic in Korea using high-quality micro and administrative data.

Chapter 1 investigates the size of the initial wage disadvantages as well as the patterns of subsequent labor-market assimilation of foreign workers in Korea. Using rich and confidential-use micro-level data obtained from the Survey on Immigrants' Living Conditions and Labour Force (SILC-LF) and the Regional Employment

Survey (RES) for the period 2013–2018, we offer comprehensive evidence regarding the trends in the earnings of immigrants in Korea.

We find that immigrants in Korea earn 15% less upon arrival than natives with similar characteristics. We estimate that the wage gap between foreign and native workers diminishes by 0.44% per year spent in Korea. The patterns of assimilation differ by both gender and country of origin. Males and Asian immigrants generally follow the patterns of all foreign workers. Conversely, females reveal a smaller initial wage difference and no convergence, while immigrants from non-Asian countries and Japan initially earn higher wages than natives and then experience a relative decline in wages over time.

We suggest that the observed patterns of immigrants' assimilation are driven by changes in the prices of human capital attributes with the duration of stay in Korea. Newly arrived immigrants are heavily concentrated in the lower segment of the wage distribution when compared to natives with similar characteristics, which provides evidence of the "downgrading" of their human capital. Due to a lack of cultural understanding, poor language skills, and information deficiency with regard to the Korean labor market, the human capital accumulated by immigrants in their source countries is not easily transferable to the Korean labor market. As the returns for the human capital of foreign and native workers converge over time, wage differences by nativity diminish.

Chapter 2 studies the impact of immigration on native labor market outcomes in Korea. We place native and immigrant workers into education-experience cells and exploit the variation in the inflows of immigrants across skill groups. Then, we

examine how the immigration inflows in particular skill groups are associated with the labor market outcomes of natives in the same skill group. Our results add to the literature by providing non-US and non-European evidence, given that Korea has the fast-growing immigrant population and continued demand for foreign workforce.

The results indicate that immigration have no harmful effect on wage and employment of natives, on average. However, there is a great heterogeneity of wage effects across education groups; high school dropouts suffer from the adverse effects, whereas the effects for college graduates are positive. There was a 0.2-0.3 p.p. decrease in wage growth rate for high school dropouts and 1.3-1.4 p.p. increase for college graduates for 1 p.p. increase in immigrant share.

We find the potential explanation for these differential effects from the suggestive evidence on the degree of substitution. Specifically, we examine the similarity of occupational distribution of between natives and immigrants. While the least-educated natives and immigrants have almost identical occupation distributions, high-educated natives are likely to work in different occupational segments from the corresponding immigrants. In other words, least-educated natives and immigrants are more substitutable than high-educated natives and immigrants are.

In Chapter 3, we examine whether high or low wage immigrants leave faster Korea. In terms of labor migration, the Korean government has two opposite policy initiatives: the principle of temporary circular migration of low skilled versus rapid access to permanent status for high skilled. Despite the importance of accurate research on selectivity in out-migration in Korea, empirical evidence has been rather rare due to data limitation.

Using administrative data and microdata from the Survey on Immigrant's Living Conditions and Labour Force (SILC-LF), we found no association between wages in Korea and out-migration hazard. Separate estimations by area of the region and visa type indicate heterogeneous effects of wages. While the same pattern is observed in Asian, non-professional employees, students, and residents with that observed in the all immigrants, Non-Asian and Japanese and professional immigrants are found to be positively selected.

The evidence for positive selection in out-migration for professional employees imply suggests a mismatch between Korean immigration policy, which intends to attract and retain highly skilled immigrants, and realities. It is critical to understand why skilled immigrants leave to achieve the policy goal. One possible explanation is that Korea can be considered as intermediary countries to the final destination for skilled migrants. Migrants may enter Korea, which is likely to be easier to enter, first and use Korea as a stepping stone to their preferred destinations, such as other Asian developed countries or Western countries. Even if skilled migrants did not plan to a third-country destination before coming to Korea, they can move wherever the economic prospects are the highest since their human capital and skills are globally transferable.

Keywords: Immigration; Assimilation; Downgrading; Wages; Employment; Occupational segmentation; Out-migration; Selection

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Chapter 1. The Immigrant Wage Gap and Assimilation in Korea

1.1. Introduction

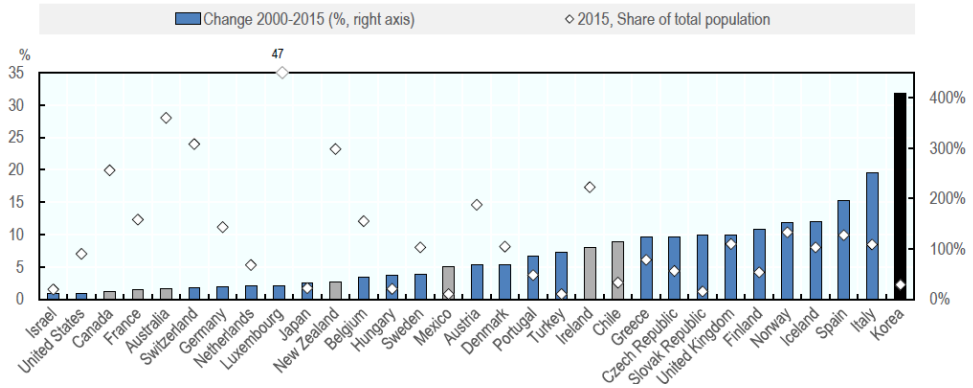
The way in which immigrants assimilate into their host countries' economies has long been a central theme of the empirical literature concerning immigration, principally because the relative position of immigrants in a country's earnings distribution determines whether and to what extent they contribute to that country's economy (Dustmann and Glitz, 2011).[1] It has been well established that immigrants receive relatively lower earnings when compared to natives at the beginning of their labor market career in their host country, although their earnings do rise with the time spent in the host country (Chiswick, 1987; Borjas, 1985; Borjas, 2014). Prior research regarding immigrant assimilation has concentrated on traditional immigration countries, including the USA, UK, Canada, and Australia. However, in recent times, many countries have evolved from emigrant-sending to immigrant-receiving countries. Nevertheless, empirical studies on assimilation in these countries, especially in the case of Asian countries, remain scarce. This paper explores the economic assimilation of immigrants, which is defined as the convergence in economic outcomes between natives and immigrants during the post-migration period, in South Korea (hereafter, Korea). Not only is the size of the

[1] We use the terms "immigrants" and "foreigners" interchangeably to refer to people who reside in a host country but who retain foreign citizenship.

immigrant workforce increasing in Korea, but the duration of stay of immigrants is also lengthening. The case of Korea is quite unique in that it is one of the most ethnically homogeneous countries worldwide and immigrants mostly come from China and Southeast Asia, with those being different source countries when compared to the typical countries of origin of immigrants to the USA and European countries.

Over the past few years, Korea has experienced rapid migration inflow growth. Indeed, the increase in the foreign population between 2000 and 2015 was approximately 400%, which was by far the fastest growth seen among the Organisation for Economic Co-operation and Development (OECD) countries, as reported in Figure 1.1. A substantial number of immigrants have arrived with working visas, and they are supposed to fill vacancies for so-called 3D (dirty, dangerous, and difficult) jobs—blue collar jobs such as construction workers or production line hands. At the same time, Korea is currently suffering from a decline in the working-age population as a result of both aging and low fertility rates, which has encouraged the arrival of more migrants of working age. Moreover, the number of immigrants with long-term and permanent residency visas is also increasing. Many immigrants with temporary working permits extend their visas or change them to semi-permanent or permanent visas in order to settle in Korea.

Figure 1.1. The Change in the Foreign Population 2000–2015 and the Share of the Total Population in 2015



Source: OECD (2019)

Given the rapidly growing immigrant population and the continuing demand for foreign workers, it is crucial to investigate the economic performance of immigrants in Korea. Using rich and confidential-use micro-level data obtained from the Survey on Immigrants' Living Conditions and Labour Force (SILC-LF) and the Regional Employment Survey (RES) for the period 2013–2018, we offer comprehensive evidence regarding the trends in the earnings of immigrants in Korea. To the best our knowledge, this will be the first study to do so. We investigate how immigrants assimilate into the Korean labor market. Additionally, we provide evidence concerning the downgrading of the human capital of immigrants, which is a key determinant of the initial earnings gap between immigrants and natives. Downgrading occurs when the economic position of immigrants, as measured in this paper by the wage rate, is systematically lower than that of natives with the same human capital (Dustman et al., 2016). Due to a lack of cultural understanding, poor language skills, and information deficiency with regard to the Korean labor market,

the human capital accumulated by immigrants in their source countries is not easily transferable to the Korean (host) labor market.

The major findings of this paper are as follows. Immigrants initially earn 15% less than natives, holding constant with both age and education. The native-immigrant wage gap closes at a rate of 0.44% per year spent in Korea. Nevertheless, immigrants' wages do not seem to ever fully converge with natives' wages. We also find that the returns for the education and experience of immigrants are lower upon arrival than those of natives. Acquiring experience in Korea helps immigrants to translate their existing human capital into aspects of value in the Korean labor market. Therefore, the returns for foreign human capital increase with the time spent in Korea, which could lead to wage assimilation. In addition, heterogeneity exists in relation to wage growth and downgrading across both gender and source country.

The remainder of this paper is organized as follows. Section 1.2 introduces the background of immigration to Korea, while section 1.3 briefly reviews the relevant prior literature. Section 1.4 introduces the data and sets out the descriptive statistics relied on in this study. Section 1.5 presents the main findings, while section 1.6 concludes the paper.

1.2. Immigration to Korea

Prior to the early 1990s, Korea was considered to be a country characterized by emigration. During the 1960s and 1970s, Korean nurses and miners were dispatched to Germany as "guest workers." After that, the outflow of Korean construction

workers to the Middle East increased during the construction boom of the 1970–1980s. Additionally, immigration to the USA was boosted after the Immigration Act of 1965 removed the restrictions on Asian migration and prompted the arrival of a large number of immigrants from Asia. However, as the economic circumstances and political conditions in Korea began to improve, the size of Korean outflows started to decrease greatly during the 1980s (Oh et al., 2011).

Following the rapid economic growth and industrialization, a shortage of low-skilled workers occurred among small- and medium-sized manufacturing firms and construction companies, which caused immigration to Korea to begin in significant numbers. To solve the worker shortage problem, the Korean government sought to attract foreign workers with the introduction of the "Industrial Trainee System" in 1993, which was later changed to the "Employment Permit System." These policies officially invited foreign workers to the country through bilateral agreements, mostly with China (predominantly ethnic Koreans living in China), Vietnam, Bangladesh, and other Asian countries.

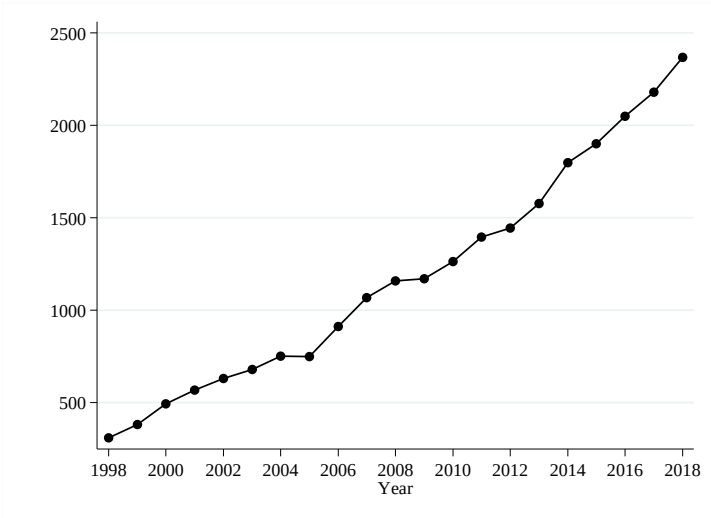
In the meantime, Korea experienced very high educational attainment, especially among young people. Indeed, the rate of participation in tertiary education and the completion rate for upper secondary education are among the highest of all the OECD countries. Thus, after the 2000s, the low-skilled labor supply decreased due to an excess supply of college graduates. There remain relatively few people among the youth cohort willing to take low-skilled/low-paying jobs, which means that the labor shortage problem in the 3D industries has been exacerbated. Additionally,

population aging and the low birth rate problem have both proceeded at a rapid pace, leading to a decline in the working-age population. Immigration could potentially serve to counterbalance the labor market imbalance and the demographic change.

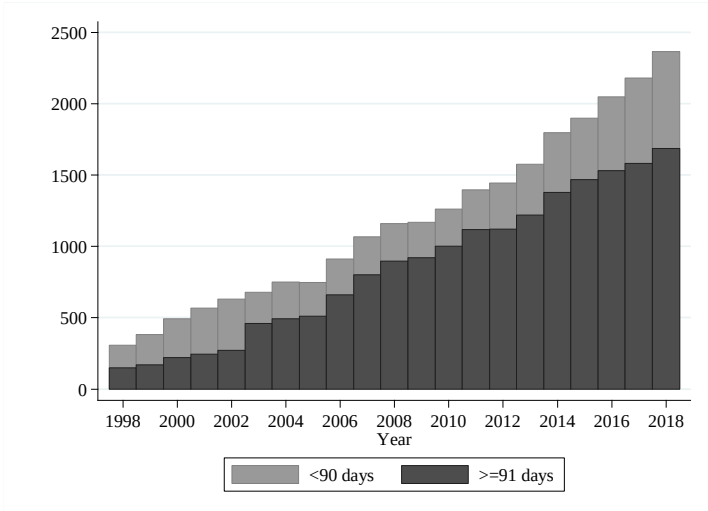
Korea is arguably now an immigrant-receiving country with a rapidly growing foreign population, although the share of foreigners in the total population is still relatively small when compared to that in traditional immigrant-receiving countries. Between 1998 and 2018, the number of foreigners in Korea increased from 0.3 million to 2.4 million, representing an eight-fold increase. The proportion of foreigners who stayed in Korea for more than 91 days has also risen sharply since the early 2000s (Figure 1.2).

Figure 1.2. Trends in the Number of Foreigners in Korea (1998–2018)

A. Total Number of Foreigners



B. Proportion of Foreigners Staying in Korea for More than 90 Days



Source: Ministry of Justice of Korea (1998~2018)

Additionally, a growing number of immigrants with short-term working visas intend to remain in Korea by extending their stay through reemployment or by applying for skilled worker visas. For example, an immigrant with E-9 and H-2 temporary working permits can initially remain employed in Korea for a maximum of three years, although if the immigrant's employers want to reemploy him/her and the immigrant worker wants to remain in Korea for longer, the period of stay can be extended by a maximum of two years. About 60–70% of immigrants with E-9 or H-2 permits whose initial visas were nearing expiration applied for reemployment between 2007 and 2013 (Cheng et al., 2013). Furthermore, in 2018, the Korean government introduced a new visa transition policy to bridge the gap between the temporary working visa and the E-7-4 skilled worker visa. The policy relies on a point-based system, with the points being determined by the combined value of the

applicant's education, age, work experience, language skills, and a technician certificate acquired in Korea (Cheng et al., 2015). With an E-7-4 visa, immigrant workers can stay in the country permanently, so long as the visa is renewed once every two years.

According to Table 1.1, if foreigners with a visa that lasts for less than 90 days are excluded, one-fifth of all immigrants are overseas Koreans (F-4), with the majority of them being Korean-Chinese. The share of immigrants with temporary low-skilled work visas, that is, the non-professional employment (E-9) and working visas (H-2), is approximately 34%. Skilled workers comprise only 3.1% of foreigners. Table 1.2 displays the source composition of the immigrant population in Korea. Approximately 87% of all immigrants are Asian, while 11.5% of immigrants come from North America and Europe. It is worth noting that 31.5% of immigrants are Korean-Chinese. After this group, Chinese nationals comprise 17% of immigrants, followed by Vietnamese nationals (7.6%). Among the non-Asian immigrants, the share of immigrants from the USA is the highest (7.2%).

Table 1.1. Percentage of Immigrants by Visa Category

F-4 (Overseas Koreans)	22.0
E-9 (Non-professional employment)	17.5
H-2 (Working visa)	16.8
F-5 (Permanent residents)	7.9
F-6 (Marriage migrants)	7.8
D-2, D-4 (Students)	7.2
E-1~E-7 (Skilled workers)	3.1
Others	17.6

Note: Foreigners with visas for less than 90 days are excluded.
Source: Korean Immigration Service (2013~2018)

Table 1.2. Source Country Composition of Immigrants in Korea

Percentage of immigrants by continent group	
Asia	86.54
North America	8.50
Europe	2.99
Africa	0.92
Oceania	0.77
South America	0.28
Others	0.01
Percentage of immigrants by most common country	
Korean-Chinese	31.52
China	17.01
Vietnam	7.57
USA	7.21
Thailand	5.66
Philippines	2.81
Japan	2.73
Uzbekistan	2.63
Indonesia	2.35
Cambodia	2.14

Source: Korean Immigration Service (2013~2018)

1.3. Literature Review

Beginning with the pioneering work by Chiswick (1978), numerous studies have sought to examine how the labor market performance of immigrants evolves in the host country, with the focus mainly being on wage assimilation. Chiswick's (1978) work involving single cross-sectional data suggested that immigrants' earnings grow rapidly and actually overtake natives' earnings about 10–15 years after immigration.

However, Borjas (1985) noted that the first generation of research failed to account for the relative quality differential among immigrant entry cohorts. Using repeated cross-sectional data and accounting for the cohort effect, he identified slower economic assimilation than that shown in a simple cross-sectional data, and further, he revealed a decrease in the quality of successive immigrant cohorts according to a change in the origin mix. Borjas (2014) argued that the decline in the unobserved labor market skills of immigrants could be attributed to a change in the USA's immigration policies. The quota system, which had favored the entry of European immigrants, was abolished in 1965, after which the USA government permitted the entry of a sizable number of undocumented immigrants.

Following these seminal works, a number of studies identified the trends in the wages of immigrants within and across cohorts, not only in the USA but also in Canada and Europe.[2] Most such studies used various census-based repeated cross-sectional data to allow a distinction between the assimilation (years since migration) effect and the cohort effect, although some researchers exploited the longitudinal dimension of datasets. The assimilation literature did not reach a clear consensus as to whether or not there is an earnings catch-up or crossover between natives and immigrants. Some studies found immigrants to catch-up to the earnings of native workers (Lalonde and Topel, 1992; Edin et al., 2000; Costant and Massey, 2005), while others found no such convergence (Pischke, 1992; Dustmann, 1993; Baker and

[2] See Lalonde and Topel (1992), Dustmann (1993), Baker and Benjamin (1994), Borjas (1995), Edin et al. (2000), Barth et al. (2004), Constant and Massey (2005), Antecol et al. (2006), Lubotsky (2007), and Abramitzky et al. (2014). Moreover, see Dustmann and Glitz (2011) for a comprehensive survey of earning trends among immigrants.

Benjamin, 1995; Schmidt, 1997). Entry earning differentials and assimilation patterns have also been found to vary by both source country and ethnic origin (Stewart and Hyclak, 1984; Borjas, 1985; Schoeni, 1997; Longva and Raaum, 2003; Barth et al., 2004; Clark and Lindley, 2009; Abramitzky et al., 2014). For example, in the USA, the entry earnings of Europeans were relatively high and their earning trends were comparable to those of natives. In contrast, immigrants from East Asia entered with lower wages, although they quickly caught up with native workers. Further, Mexicans and Central Americans entered with low wages and there was no wage convergence between them and natives (Schoeni, 1997).

One potential explanation for the entry wage gap is the downgrading of immigrants' skills upon arrival. Downgrading here refers to the fact that immigrants obtain lower returns for observed human capital such as education and experience when compared to natives (Dustmann et al., 2013). New immigrants may lack sufficient language skills and knowledge of the local labor market; thus, they may be unable to fully utilize their human capital during the post-migration period. Numerous studies have reported that education and experience are valued lower for immigrants in the host country's labor market, and further, they have found evidence of substantial heterogeneity across source countries (Shields and Wheatley Price, 1998; Sanroma et al., 2015; Basilio and Bauer, 2017). Additionally, both Friedberg (2000) and Bratsberg and Ragan (2002) made a distinction between human capital acquired in the source country and human capital acquired domestically, and they reported lower returns for foreign education due to the imperfect portability of

human capital. Dustmann et al. (2016) presented evidence of the downgrading of recently arrived immigrants in the UK, Germany, and the USA. They reported that the degree of downgrading becomes less substantial the longer immigrants stay in the host country, as in doing so they proceed to acquire country-specific capital.

While many empirical studies concerning immigrant assimilation have been conducted in the USA, Canada, Europe, and other major immigrant-receiving countries, the previous literature regarding Asian countries is relatively scarce. Lie et al. (2004) suggested occupation segregation to be a potential cause of the earnings differentials observed between natives and immigrants in Hong Kong, and they showed that occupational segregation decreases as the duration of stay in Hong Kong rises. Yamauchi (2004) showed that the accumulation of experiences in the destination country raises the wages of migrants in Bangkok, and further, that the effect is larger for more educated immigrants. Takenaka et al. (2016) focused on skilled migrant populations in Japan due to a lack of large-scale systematic data and the reliable registration system, and they observed negative assimilation.

Furthermore, little is currently known about immigrants' performance in the Korean labor market due to the lack of reliable micro-level data. Cho (2010) used single cross-sectional data and found the immigrant-native wage differential to be 24%. Kang et al. (2013) concentrated on low-skilled immigrants, with their results indicating that language ability, tenure, and domestic skill certificates are all positively correlated with wages. However, it is important to note that Kang et al. (2013) did not cover all immigrants, as they focused on only a specific immigrant

group. Kim (2015) used publicly available survey data concerning immigrants, which do not report the monthly wage as a continuous variable, but rather report the wage within particular intervals (e.g., less than 1,000,000 KRW; 1,000,000 KRW to 2,000,000 KRW; 2,000,000 KRW to 3,000,000 KRW; more than 3,000,000 KRW). Thus, the mean of the wages from each specific interval was used as the dependent variable in Kim's (2015) study, which indicates that it is difficult to accurately measure the rate of economic assimilation using publicly available data. In the present paper, we use detailed information on labor market outcomes, including the continuous wage, obtained from the confidential-use SILC-LF data. Additionally, unlike Cho (2010), repeated cross-sectional data are used here to distinguish between the assimilation effect and the cohort effect. Moreover, we provide the results disaggregated by gender and by source country. As a result of the higher quality of the utilized data, this paper can rigorously analyze the wage assimilation and downgrading of immigrants in the Korean labor market.

1.4. Data and Descriptive Evidence

This paper uses micro-level data collected in the SILC-LF, the largest national immigrant survey conducted in Korea, which started in 2012 as the Labor Force Survey. The questionnaire gathers information about immigrants' labor market status (monthly wage, hours of work, industry, occupation, other job characteristics) and socio-demographic characteristics (age, gender, education, marital status, region of residence), as well as migration-specific information (years since migration, visa

type, source country).[3] The target population is immigrants aged 15 years and over who are staying in Korea for longer than 90 days.[4]

While most immigrant-receiving countries conduct labor force surveys of both natives and immigrants, Statistics Korea does so separately for the two groups. Therefore, to compare the economic positions of immigrants and natives, we merge the SILC-LF with the RES, a nationally representative household survey of natives.[5] We also link the administrative arrival and departure history to survey data on an individual level for the period 2017–2018, in order to identify the determinants of out-migration from Korea and to assess how the selective out-migration problem affects estimates of assimilation. Studies using longitudinal data have shown that selective out-migration could contaminate the rate of assimilation (Hu, 2000; Lubotsky, 2007; Dustmann and Gorlach, 2015). Indeed, if return migration is negatively (positively) selected, the typical estimated rate of assimilation based on repeated cross-sections would be upwardly (downwardly) biased.

Our sample period for the baseline analysis covers the period from 2013–2018, and the sample consists of people aged 25–65 years (as of the time of the survey)

[3] The 2013–2016 SILC-LF does not report the exact years in which immigrants resided in Korea, but instead reports the years within particular intervals (e.g., less than six months; six months to one year; one year to two years; two years to three years; three years to four years; four years to five years; five years to nine years; ten and more years). Following the approach of Borjas (2003), we use a uniform distribution and randomly assign the immigrants in each interval in a baseline specification. The maximum years since migration is set to 20 years. We also use the midpoints of each interval, and the results are very similar to the baseline results.

[4] From 2012 to 2016, the target population for the SILC-LF is people who resides in the country but are not Korean citizens, which is the definition of "immigrant" in our paper. In 2017, naturalized people, who were born abroad but voluntarily became Korean citizens, were added to the sample. Naturalized people are excluded here so as to achieve a consistent definition of immigrants.

[5] It is known that a very small portion of immigrants are included in the sample of the RES, although the immigrant sample is not identified in the dataset.

who report a positive monthly wage and working hours and who are not enrolled in school.[6] The hourly wage distributions are trimmed at 1% and 99% so as to remove outliers. The sample contains of 740,491 individuals, some 4.21% of whom are immigrants. Table 1.3 presents separate summary statistics for natives and immigrants, with the immigrants being further divided into earlier and recent immigrants. We define "earlier immigrants" as immigrants who have been in Korea for three years or more at the time of the survey, while "recent immigrants" are immigrants who have been in Korea for less than three years.

On average, we find that immigrants are younger, less educated, and more likely to be male and married. We also observe that the average monthly and hourly wages of natives are higher than those of immigrants, while immigrants work more hours than natives (Columns 1 and 2 of Table 1.3). Natives are primarily employed as professionals and clerks, while immigrants are mostly employed as elementary and assembly workers. Among the immigrants, recent immigrants receive lower wages than earlier immigrants. Moreover, they tend to be in low-skilled occupations despite being more educated than earlier immigrants. As time goes by, they move into relatively high-skilled occupations, albeit still in lower occupation categories than natives (Columns 3 and 4 of Table 1.3). This finding suggests that new immigrants start with lower wages and occupations due to the underutilization of their human capital (Eckstein and Weiss, 2004).

[6] Even though the survey started in 2012, the "years since migration" variable was not included in the first survey. Thus, we restrict the sample period to 2013–2018.

Table 1.3. Socio-Economic Status and Labor Market Outcomes of Immigrants and Natives

	Native	Immigrants	Earlier Immigrants (> 3 years)	Recent Immigrants (≤ 3 years)
Age	42.83	40.12	42.25	35.93
College graduates (%)	0.55	0.27	0.26	0.29
Male (%)	0.58	0.67	0.64	0.73
Married (%)	0.67	0.69	0.74	0.57
Monthly wage (KRW)	2,411,236	1,966,662	2,005,907	1,889,479
Working hours	46.54	52.82	52.85	52.78
Hourly wage (KRW)	12,293	9,199	9,400	8,804
Occupations (%)				
Managers	1.56	0.67	0.72	0.56
Professionals	22.75	8.06	8.10	7.98
Clerks	22.54	2.79	3.14	2.12
Service workers	8.65	9.06	10.25	6.73
Sales workers	8.23	2.12	2.31	1.75
Skilled agricultural workers	0.23	2.21	1.59	3.43
Craft workers	9.65	14.69	16.29	11.55
Assembling workers	12.63	27.00	24.70	31.52
Elementary workers	13.78	33.39	32.89	34.36

Source: Authors' calculation, RES and SILC-LF, 2013–2018.

1.5. Empirical Results

1.5.1. Economic Assimilation

We estimate the following standard earnings function, as used in the immigration assimilation literature, in consecutive cross sections:

$$\log w_{it} = \alpha' X_{it} + \beta F_i + \gamma \mathrm{YSM}_{it} + \varphi_c + \tau_t + e_{it} \qquad (1.1)$$

where w_{it} is the hourly wage of individual i in survey year t;[7] X_{it} is a vector of the socio-demographic variables, which include the years of schooling, age (and the square term of age), and male dummy; F_i is an indicator variable equal to one if individual i is an immigrant and otherwise equal to zero; YSM_{it} is the years since migrating to Korea, which is equal to zero for natives;[8] and φ_c is a vector of the fixed effects indicating a specific immigrant arrival cohort. The arrival cohorts are as follows: those who arrived in Korea before 2003, between 2003 and 2007, between 2008 and 2012, and after 2012. Moreover, τ_t denotes a vector of the survey year fixed effects and e_{it} is an error term. It is important to note that we confront perfect collinearity problems among a number of variables, namely the years since migration, arrival-cohort year, and survey year. To identify the parameters, a restriction is imposed such that the year effects are the same for both immigrants and natives, as suggested by Borjas (1985).

The results from the estimation of Equation (1.1) are presented in Table 1.4. The first column of Table 1.4 indicates that immigrants earn 15% less than natives at the time of arrival (conditional on age and education), with the wage gap closing at a

[7] We construct an hourly wage using the monthly wages and the hours worked per week, assuming that the number of weeks worked in a given month is 4.3.

[8] To account for the non-linear effect of years since migration, we were able to include the square term of years-since-migration, but it proved to be statistically insignificant. Thus, it is excluded from the baseline specification.

rate of 0.44% a year. When the arrival cohort dummies are introduced, there is little change in either the estimated rate of assimilation or the initial wage gap (Column 2 of Table 1.4). The trend in earnings growth between the native and immigrant workers appears to evolve very similarly regardless of whether or not the cohort fixed effects are controlled. Interestingly, the coefficients of the arrival cohort dummies are not significant, which indicates that there are no differences in the quality of the immigrant arrival cohorts in terms of entry earnings.

Columns 3 and 4 of Table 1.4 reveal a marked gender difference with regard to both the native-immigrant wage gap and assimilation. It is clear that male immigrants experience a wage gap when compared to male natives during the initial period after arrival, although they enjoy a significant wage increase as they accumulate labor market experience in Korea. However, there is no initial native-immigrant wage gap for female immigrants. We also find that the assimilation effect is insignificant, which suggests no wage growth. The arrival-cohort effects are not significant for either male or female immigrants. The results when the immigrants are separated into two source country groups are presented in Columns 5 and 6 of Table 1.4. At the time of arrival, Asian immigrants (except for Japanese immigrants) face a large wage disadvantage (26% less than natives), although their assimilation rate is much higher than that of all other immigrants. Additionally, we find evidence of the increased quality of immigrants from Asian countries.[9] Immigrants from non-Asian countries

[9] The results when Asian immigrants are split into Korean-Chinese and other Asian show that the positive assimilation for Asian immigrants are largely driven by Korean-Chinese. The estimated wage assimilation for them is positive and significant while the estimate for other Asian is not statistically significant. Korean-Chinese tend to cluster geographically and socially, thus they can share

and Japan, mostly from Western and European countries, enjoy wages that are 61% higher than natives, although their estimated wage assimilation is actually *negative*. It is important to note that the coefficients of the cohort dummies demonstrate a deterioration in the quality of non-Asian and Japanese immigrants.[10][11]

information about labor market and build social capital, which can help them integrate into Korean economy.

[10] We also investigate the heterogeneity of the rate of economic assimilation across visa type. While skilled immigrants exhibit the similar patterns with non-Asian and Japanese immigrants, the results for unskilled immigrants are similar with those for Asian immigrants.

[11] Equation (1.1) imposes the important restriction—equal returns to immigrants' human capital and natives' human capital. Even when allowing the return to human capital to vary on whether the worker is an immigrant or a native, the estimated coefficients on years since migration are quite similar to those from baseline specification.

Table 1.4. Estimated Assimilation Rates for Immigrants

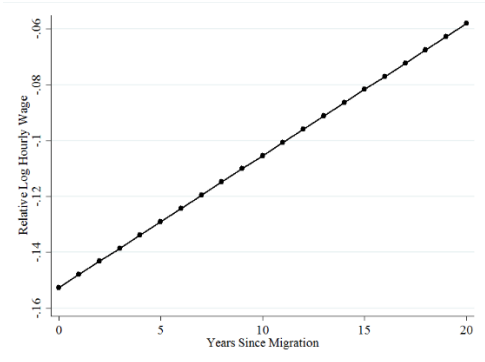
	(1)	(2)	(3)	(4)	(5)	(6)
Sample	All	All	Male	Female	Asia	Non-Asia and Japan
Years since migration	0.0044***	0.0047***	0.0043**	-0.0017	0.0098***	-0.0329***
	(0.0006)	(0.0014)	(0.0018)	(0.0022)	(0.0014)	(0.0057)
Immigrant arrival cohort						
2003–2007		0.0051	-0.0078	-0.0180	0.0393**	-0.1255**
		(0.0158)	(0.0206)	(0.0239)	(0.0158)	(0.0600)
2008–2012		0.0020	-0.0020	-0.0228	0.0618***	-0.2562***
		(0.0198)	(0.0259)	(0.0300)	(0.0198)	(0.0822)
After 2012		0.0079	0.0230	-0.0430	0.0887***	-0.4972***
		(0.0228)	(0.0293)	(0.0360)	(0.0227)	(0.0935)
Immigrants	-0.1470***	-0.1527***	-0.1659***	-0.0349	-0.2621***	0.6091***
	(0.0043)	(0.0246)	(0.0317)	(0.0386)	(0.0246)	(0.0988)
Observations	740,491	740,491	430,128	310,363	737,247	712,551
R-squared	0.3347	0.3347	0.2681	0.2621	0.3355	0.3345

Source: Authors' calculation, RES and SILC-LF, 2013–2018.
Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log hourly wage. All the regressions include age, age squared, male dummy (excluded in Column (3) and (4)), school year, and survey year dummies as control variables. The reference category for the Immigrant arrival cohort dummies is "before 2003."

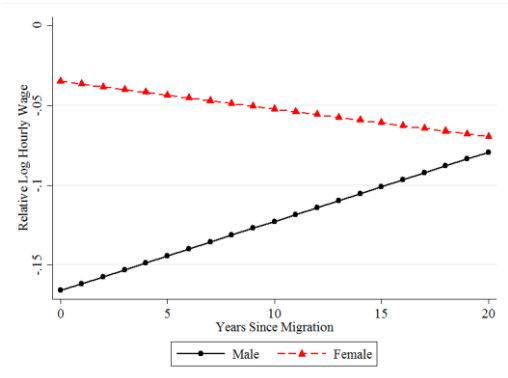
Figure 1.3 (Panels A, B, and C) presents the implied path of the relative wages of immigrants, as based on the estimated coefficients of years since migration shown in Table 1.4. More specifically, the figures plot the log hourly wage gap between immigrants and natives, with the age and schooling year being kept constant. Panel A of Figure 1.3 plots the assimilation path for all immigrants, showing the entry wage differential and catch-up. Yet, even 20 years after arrival, the gap is still 6%, implying that complete convergence with natives' wages is not achieved. Panel B of Figure 1.3 compares the earnings growth profiles between male and female immigrants. Despite the relatively high assimilation rates seen for males, male immigrants still face considerable gaps 20 years after entry given their large initial gap. In case of the female sample, the entry gaps are relatively small, although there is no evidence of positive wage assimilation for females. We next examine the wage growth separately for Asian and non-Asian and Japanese immigrants (Panel C of Figure 1.3). We confirm that Asian immigrants start out with lower wages than natives, then assimilate upward, although they do not fully converge. Somewhat surprisingly, immigrants from non-Asian countries and Japan end up with lower wages than natives despite their much higher entry wages.

Figure 1.3. Assimilation Profiles

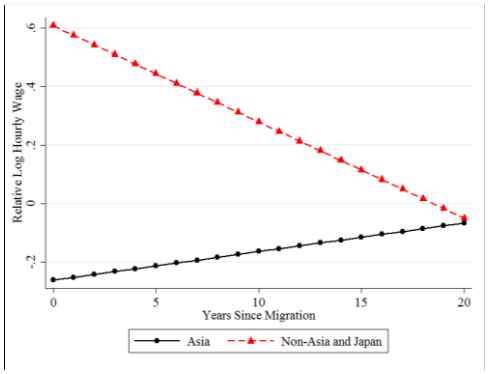
A. All Immigrants



B. Male and Female Immigrants



C. Asian and Non-Asian and Japanese Immigrants



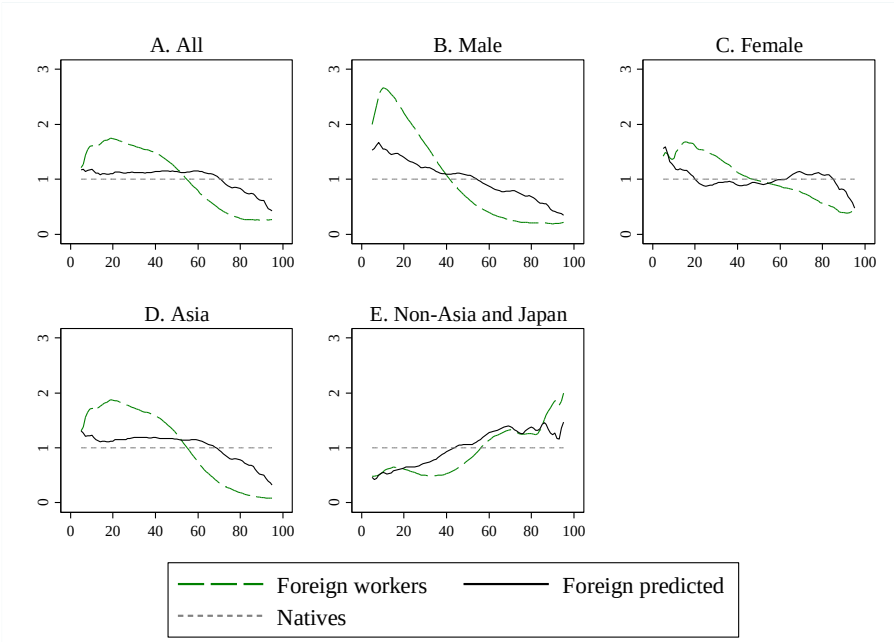
Source: Authors' calculation, RES and SILC-LF, 2013–2018.

1.5.2. Downgrading

The initial native-immigrant gap can be principally attributed to the significantly lower value placed on human capital obtained in the source country. In this subsection, we provide evidence of the downgrading of immigrants in Korea following the approach of Dustmann et al. (2013) and Dustmann et al., (2016). Figure 1.4 illustrates where recent immigrants, that is, those who arrived in Korea within the last three years, are actually located in the native wage distribution (the long-dashed line) as well as where we would allocate them if they received the same return for their age-based potential experience and education as natives (the solid line). In more detail, we first estimate the wage equation for natives (where the regressors are four age categories [25–35, 36–45, 46–55, and 56–65] and four educational categories [high school dropouts, high school graduates, some college, college graduates]) and the interactions terms between the two regressors separately for males and females and for different survey years. Next, we compute the predicted wages for immigrants, adding a normally distributed error term with heteroscedastic variance according to age groups, education group, and gender. Finally, we compute the rank of each immigrant within the native wage distribution for both the actual and predicted wages. Consistent with evidence obtained from the USA, the UK, and Germany by Dustmann et al. (2016), recent immigrants are overrepresented at the bottom of the wage distribution. They are much more concentrated below the median and less concentrated above it than expected based on their predicted position. We find similar patterns for recent male, female, and Asian immigrants (Panels B to D

of Figure 1.4). Additionally, we find that the differences for females are smaller than for males in the case of recent immigrants, which is consistent with less initial wage differences being found for females (Panels B to C of Figure 1.4). In Panel E of Figure 1.4, recent non-Asian and Japanese immigrants are predicted to be less concentrated below the 40th percentile and more concentrated above it, which is exactly the opposite of typical recent immigrants. Even though they are not "downgrading" in the sense that the long-dashed line (representing the density of the actual distribution) lies under the solid line (representing the density of the predicted distribution) at the bottom and middle of the wage distribution, the fact that it lies above the solid line at the upper ends of the distribution implies that non-Asian immigrants receive higher wages than natives with the same levels of education and experience.

Figure 1.4. Downgrading of Recent Immigrants



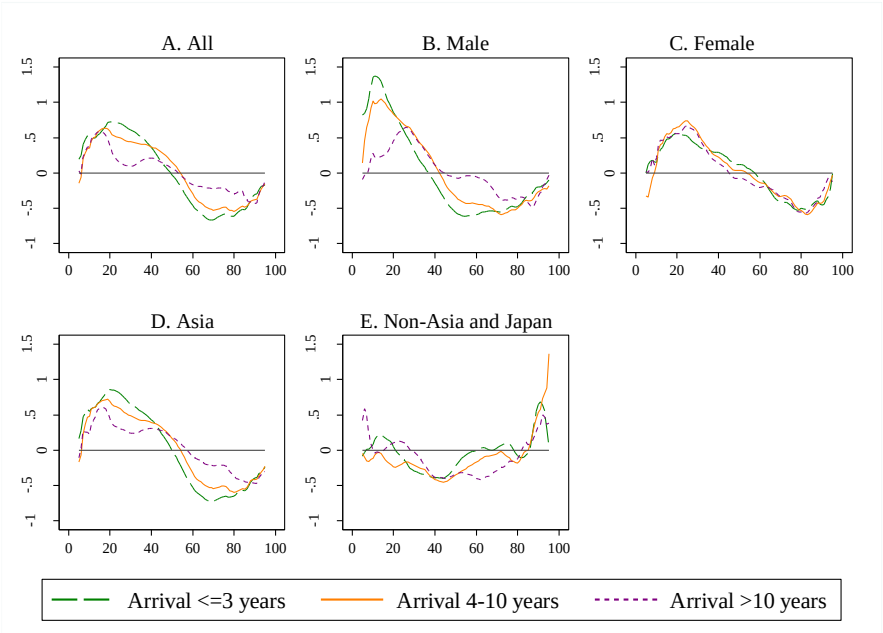
Source: Authors' calculation, RES and SILC-LF, 2013–2018.

Note: The y-axis shows the density of immigrants relative to natives (horizontal line at 1). The x-axis shows the percentile of native wage distribution. These panels present kernel estimates of the actual (long-dashed line) and predicted (solid line) density of immigrants in the native wage distribution.

With time spent in Korea, immigrants acquire country-specific capital, which is complementary to their existing human capital, meaning that their returns for schooling and experience increase. Figure 1.5 plots the difference between the actual and predicted wage distributions for immigrants with different numbers of years since migration to Korea. If immigrants receive more similar wages to natives with the same levels of education and experience as the time they have resided in Korea

increases, the discrepancy should be smaller. We find that the actual and predicted distributions become more similar as the duration of the stay in Korea increases. Moreover, it seems that upgrading does not occur for female and non-Asian and Japanese immigrants, leading to no positive assimilation for these groups (Panels C and E in Figure 1.5).

Figure 1.5. Upgrading of Immigrants over Time Spent in Korea



Source: Authors' calculation, RES and SILC-LF, 2013–2018.
Note: The y-axis shows the difference between the actual and the predicted densities of immigrants. The x-axis shows the percentile of native wage distribution.

1.5.3. Discussion

Our results suggest that each year of Korean experience increases immigrants' wages by 0.44%, which is relatively small in magnitude. The point estimate lies

under the range of estimates reported in previous studies that used a similar methodology to that used in this paper. Research conducted in the USA reports the generally positive assimilation of immigrants, and the estimated rates of assimilation are above 1% (e.g., 1.8–2.1% from Borjas [1995], 2.1% from Funkhouser and Trejo [1995], 1.0–2.5% from Bratsberg and Ragan [2002]). In addition, Sanmora et al. (2015) reported that a year spent in Spain led to a wage hike of 1.7% for immigrants. The relative earnings of immigrants living in Israel have been found to rise by 0.8% per year following migration (Friedberg, 2000). Basilio et al.'s (2017) results, which were obtained in Germany, suggest that male immigrants' relative wages increase by 0.4% and female immigrants' wages by 0.2% each year after migration, findings that are quantitatively similar to our estimates. For immigrants in Canada, Australia, and the UK, the years since migration variable has a mostly insignificant or negative effect on wages.

Furthermore, we find that wages increase with the duration of residence in Korea for male immigrants, while the estimates for female immigrants are not significantly different from zero. This might be due to the significant gender difference in the industrial distribution. Table 1.5 shows the fraction of native and immigrant workers employed in each of the two-digit industries by gender. More than the half of all immigrant men are employed in the manufacturing industry, while the largest portion of immigrant women are employed in the accommodation and food service sector. The age-wages profiles of workers in the manufacturing sector are much steeper than the age-wages profiles of individuals in the accommodation and food service sector

(Figure 1.A1). Industrial segregation by gender may have a differential impact of the Korean experience in terms of wages of immigrant men and women.

Table 1.5. Industrial Distribution of Immigrants and Natives

	Male		Female	
	Native	Immigrant	Native	Immigrant
Agriculture	0.49	4.59	0.54	2.79
Mining	0.14	0.10	0.03	0.01
Manufacturing	26.73	56.62	14.84	30.77
Electricity	0.71	0.03	0.19	0.00
Water supply	0.68	0.92	0.17	0.18
Construction	12.98	15.82	1.73	1.73
Wholesale	10.31	3.21	13.25	6.65
Transportation	6.41	0.65	1.56	0.19
Accommodation and food service	2.88	4.55	9.86	31.29
Information and communication	4.75	0.58	2.31	0.49
Financial activities	3.46	0.26	5.40	0.40
Real estate	1.59	0.18	1.41	0.26
Technical activities	5.61	1.05	3.65	1.23
Business support	5.64	5.97	6.52	5.81
Public administration	6.04	0.09	3.96	0.31
Education	4.52	3.46	12.29	6.75
Social work	2.24	0.36	16.06	3.25
Arts and sports	1.14	0.19	1.23	0.32
Membership organization	3.56	1.31	4.07	2.93
Household activities	0.01	0.05	0.90	4.62
International organization	0.09	0.02	0.04	0.03

Source: Authors' calculation, RES and SILC-LF, 2013–2018.

Lastly, non-Asian and Japanese immigrants earn a wage premium upon arrival,

although it quickly disappears with time spent in Korea, in contrast to the wage growth of Asian immigrants. However, these results would suffer from bias if there is selective out-migration of immigrants. To investigate how immigrants' wages are associated with subsequent emigration, we match the SILC-LF data to the administrative record of entry and departure dates for the years 2017–2018. and then apply the Cox regression approach. The matching process is based on personal characteristics such as date of birth, sex, source country, visa type, and year of entry. Approximately 47% of the whole sample is correctly matched; thus, the final sample size is 6,132. The hazard ratio, that is, the effects of the covariates of out-migration, can be seen Table 1.A1. Wages are positively associated with the out-migration hazard for all migrants. In particular, the positive effect is the strongest for the non-Asian and Japanese migrants. The coefficient in Column (4) of Table 1.A1 implies that a 10% rise in the monthly wage increases the out-migration hazard by 7.7%.[12] Although the estimated assimilation rate would be downwardly biased for all except for Asian migrants, it would be the most severe for non-Asian and Japanese migrants. Since most of these migrants are highly educated, employed in white-collar jobs, and have skills that are globally transferable, they tend to move to wherever the economic benefits are the highest (Takenaka et al., 2016).

1.6. Conclusion

[12] The hazard ratio is an estimate of the change in the hazard for a unit increase in the covariate when the covariate is a numerical variable. Note that a 10% increase is the same as a $\log(1.1) = 0.095$ increase in the variable, so the hazard ratio is $\exp(0.095\beta)$ in this case.

Although immigrants' assimilation into their host countries has long been a central theme of the literature concerning the economics of migration, relatively little evidence has thus far been drawn from the newly emerging immigrant-receiving countries in Asia. This study investigated the size of the initial wage disadvantages as well as the patterns of subsequent labor-market assimilation of foreign workers in Korea. With the permission and cooperation of the Korean government, we obtained and used a much richer version of the SILC-LF that was merged with the RES for the years 2013 to 2018. Thanks to the high quality of the data, we were able to provide the first reliable results regarding this issue in relation to Korea, which are compared to those obtained from major immigration countries such as the USA, the UK, Canada, and Australia.

We found that immigrant workers in Korea earn 15% less upon arrival than native workers with similar characteristics. We further estimated that the wage gap between foreign and native workers diminishes by 0.44% per year spent in Korea. The pace of convergence is too slow to achieve complete assimilation: a foreign worker would expect to earn 6% less than a comparable native worker even 20 years after arrival. The patterns of the labor-market assimilation of immigrants differ by gender and by country of origin. While males show a relatively large wage gap upon arrival and then rapidly catch-up thereafter, females reveal a smaller initial wage difference and no convergence. Moreover, Asian immigrants (except for Japanese immigrants) follow the patterns of all foreign workers. Conversely, immigrants from non-Asian countries and Japan earn higher entry wages when compared to natives, although

they experience a relative decline in wages over time.

We suggest that the observed patterns of immigrants' assimilation are driven by changes in the prices of human capital attributes. The initial wage gaps experienced by immigrants are attributable to their lower returns for education and experience when compared to natives' returns. We found that newly arrived immigrants are heavily concentrated in the lower segment of the wage distribution when compared to natives with similar characteristics, which provides evidence of the "downgrading" of their human capital. As the returns for the human capital of foreign and native workers converge over time, wage differences by nativity diminish. Consistent with the results regarding wage assimilation, the downgrading is particularly severe for male and Asian immigrants. Newly arrived female immigrants suffer only modest downgrading, whereas non-Asian and Japanese immigrants actually enjoy higher returns for their human capital upon arrival when compared to natives' returns. However, a longer stay in Korea does not bring about any "upgrading" for female and non-Asian and Japanese immigrants.

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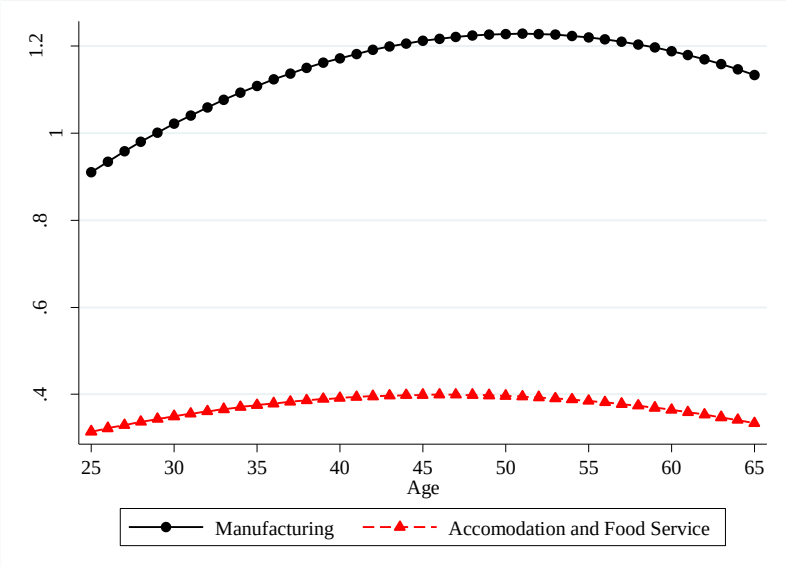
Appendix

Figure 1.A1. Age-Wages Profile by Industry



Source: Authors' calculation, RES and SILC-LF, 2013–2018.

Table 1.A1. The Effects of Wages on the Out-Migration Hazard

VARIABLES	(1) All	(2) Male	(3) Female	(4) Asia	(5) Non-Asia and Japan
Log hourly wage	1.462***	1.364**	1.546**	1.177	2.194***
	(0.169)	(0.194)	(0.334)	(0.194)	(0.302)
Observations	6,132	4,009	2,123	5,084	1,048

Source: Authors' calculation, SILC-LF, 2017–2018.

Note: Hazard ratios are reported and standard errors are given in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All the regressions include age at the date of interview, age of migrants at entry, male dummy (excluded in Column (2) and (3)), marital status dummies, source country dummies, and dummy for residence in the Seoul Metropolitan Area.

Chapter 2. The Wage and Employment Effect of Immigration: Evidence from Korea

2.1. Introduction

The question of whether immigrants affect labor market prospects of natives is one of the central issues in labor economics. The competitive labor market model with homogenous labor suggests that immigration inflows depress native wages and also cause displacement of native workers at least in the short run. However, in the economy where labor is not qualitatively identical, more realistic assumption, the immigration effects depend on the substitutability between natives and immigrants in production. Immigration will lead to a decrease in the marginal product and wages of native workers in the case where natives and immigrants are substitutable, yet natives who are complements for immigrants will enjoy beneficial effects. Assume that immigrant workers are low-skilled in general, then immigration will negatively affect the labor market outcome of low-skilled natives and raise the wages and employment levels of high-skilled natives, contributing to relative wage inequality. On the other hand, if the inflow of immigrants is "skill-balanced"—one with the same skill distribution with the existing native labor force, immigration will not change the relative wage structure (Card, 2009).

In the South Korean (hereafter, Korea) context, immigrants have been most heavily concentrated in low-skilled sectors. According to the Ministry of Justice, the

number of foreign population in Korea is increasing sharply, from 0.3 million in 1998 to 2.4 million in 2018. Among them, a sizable number of immigrants have come with temporary working visas who have been recruited to solve the labor shortages of low-skilled jobs mostly in the manufacturing and construction sectors. Low-skilled immigrants are generally viewed as competing with low-skilled natives, and it has stirred the public debate about whether immigration has harmed the labor market outcomes of low-skilled native workers. However, the existing empirical literature on the labor market effect of immigration in Korea rather scarce since lack of reliable microdata for immigrants has limited the investigation to rigorous analysis. We use the richer version of the nationally-representative labor force survey for immigrants, thus it allows us to provide reliable empirical evidence on the immigration effects.

This paper aims to investigate the impacts of immigration in Korea and how it varies across education groups. Though numerous studies employ the spatial approach for estimating the immigration effect, we use the national skill-cell approach, which slices national labor market into education and experience cell, because of relatively small scales of Korea and less biased estimates of immigration impacts. In this approach, the allocation of immigrants across skill cells is relatively exogenous. Most immigrants in the Korean labor market are adult migrants who have completed their education in the home country before migrating, thus it is least likely that immigrants choose a particular skill group in which economic benefits are best. This strategy also mitigates the possibility of compensatory native in-migration flows. Indeed, it is impossible for natives to change their skill mix by becoming

younger or older, and it is hard and costly to obtain additional education to avoid competition with immigrants in the same skill group.

We place native and immigrant workers into education-experience cells and exploit the variation in the inflows of immigrants across skill groups. Then, we examine how the immigration inflows in particular skill groups are associated with the labor market outcomes of natives. Our results add to the literature by providing non-US and non-European evidence, given that Korea has the fast-growing immigrant population and continued demand for foreign workforce.

The data source we used is the Survey on Immigrant's Living Conditions and Labour Force (SILC-LF) that was merged with the Regional Employment Survey (RES) for the years 2012 to 2018, first of which is labor force survey for immigrants and latter of which is for natives. Since we exploit yearly variation, our estimates can be interpreted as the short-run effect of immigration. The regression results for entire samples indicate that immigration has no adverse impact on overall native wages and employment. Results on separate effects by education groups reveal that wage-depressing effects are pronounced on for high school dropouts, but the impacts for college graduates are positive. Specifically, there was a 0.2-0.3 p.p. decrease in wage growth rate for high school dropouts and 1.3-1.4 p.p. increase for college graduates for 1 p.p. increase in immigrant share. It is might due to the greater overlap between the occupations that high school dropout natives and immigrant workers have, whereas college graduate natives and immigrants are dissimilar in terms of occupation distributions. In other words, low-educated natives and immigrants are

more substitutable than high-educated natives and immigrants are. Our results are not sensitive to various specifications and sample definitions.

The rest of this paper is structured as follows. In the next section, we review some literature regarding the impact of immigration on the host labor market. In section 2.3, we present the data and methodology we employ. Descriptive statistics, empirical results and discussion are in Section 2.4. We conclude in Section 2.5.

2.2. Literature Review

Until the 1990s, most researchers exploit the geographical variation to estimate the labor markets of immigration. Most of cross-region analyses of labor market effect of immigrations show that the estimated coefficient indicating the sensitivity of native wages to an increase in immigrants in a given local labor market was closely clustered around zero (Altonji and Card, 1991; Friedberg, 2001; Dustmann et al., 2005; Card and Lewis, 2007; Card, 2009; Basso and Peri, 2015). At least two problems are widely recognized with the spatial approach: endogenous immigrant penetration across local markets and native internal response. The first problem arises since immigrants tend to cluster in cities where the economic prospects are promising, and it would generate spurious positive correlation between immigration and local outcomes. Next, the initial negative effects of immigration would dissipate if natives react to immigrant inflow by moving their labor or capital across regions.

Skill-cell approach at the national level, pioneered by Borjas (2003), can avoid

these problems by examining how natives' wages and employment in a particular skill group (based on education and potential experience) are affected by differences in the level of immigration penetration into that group. Bojras (2003) finds the significant and large negative immigration effect on native wages in the U.S, and since then several papers have replicated Borjas' study using alternative samples in other countries. The results are mixed. Some studies suggest that immigration has a detrimental effect on native wages (Bonin, 2005; Aydemir and Borjas, 2007), but other studies find insignificant impacts (Carrasco et al., 2008; Breunig et al., 2017). Ortega and Verdugo (2014) using French data report that immigrant shares raise natives' wages. The lack of consensus can be accounted for the difference in sample selection, data structure, specification, and institutional setting across studies.

The important assumption in the skill-cell approach is that immigrants and natives of similar education and experience are substitutable, but the degree of substitutability of natives and immigrants is a controversial issue. Using the structural approach, Brücker and Jahn (2011) for Norway, Manacorda et al., (2012) for the U.K, and Ottaviano and Peri (2012) for the U.S. provide the evidence suggesting imperfect substitutability between natives and immigrants within skill groups. Peri and Sparber (2009) lend support to these findings by providing evidence for different comparative advantages in production tasks between natives and immigrants with similar human capital characteristics. Yet, Borjas et al. (2012) and Borjas (2014) argue these findings are sensitive to assumption and specification, thus one cannot reject that immigrants and natives are perfect substitutes. Steinhardt

(2011) and Smith (2012) examine the degree of substitutability using statistics on occupational or industrial clustering. Steinhardt (2011) highlights German natives and immigrants are employed in different occupations in the same skill groups, thus they are likely to be imperfect substitutes and the classical skill cell approach might generate biased estimates. Smith (2012) shows that young natives are more likely to work in the same industry-occupations as less-educated immigrants than adult natives and demonstrates immigration inflows have an adverse effect on employment for youth natives rather than for adult natives.

The first empirical research on the labor market effect using skill cell approach for Korea is conducted by Choi (2012), which finds immigration does not affect native wages but reduced the employment of very large magnitude. However, these results rely on the unrealistic assumption due to data limitation; he uses the 2010 Population Census as samples of immigrants and assumes the immigrants share is zero in 2000, the base year. Our paper offers more rigorous evidence on the effect of immigration in Korea using richer and recent data and further demonstrate how heterogeneous the impact of immigration is across education groups.

2.3. Data and Empirical Framework

The data source is the Survey on Immigrant's Living Conditions and Labour Force (SILC-LF), a nationally representative sample of immigrants, merged with Regional Employment Survey (RES), the microdata for natives, over 2012-2018. The target population for two surveys is aged over 15 (staying in Korea longer than 90 days in

case of immigrants). SILC-LF and RES contain information on a number of labor market-related and socio-demographic characteristics. It is known that a very small portion of immigrants is included in the sample of RES, but the immigrant sample is not identified in the dataset. Given the fact that the immigration effect on immigrants' wages and employment is negative, our estimates on native labor market outcomes would be the lower bound of the true effect.

The main sample used is male full-time workers aged 18-64.[13] We sort workers into three distinct education groups (high school dropouts, high school graduates, and college graduates) and eight potential experience groups (1-5 years of experience, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, and 36-40).[14] Potential experience is calculated as age-schooling year-6. We further restrict our samples with individuals between 1 and 40 years of experience.

Table 2.1 shows the distribution of educational attainment and experience for native and immigrants workers. On average, immigrants are less educated and younger. Despite the rise in educational attainment between 2012 and 2018 for immigrants, only one-third of immigrants are college graduates whereas the figure for natives is about two thirds. Immigration is not balanced evenly across all age groups but concentrated in low years of experience. The occupational distribution for natives and immigrants are presented in Table 2.2. High school dropout natives

[13] We test the robustness of our main results to an alternative sample selection in Section 2.4.1.

[14] "College graduates" include individuals who have not completed college and are completed some college.

are more likely to be employed in low-skilled jobs that are also commonly held by high school dropout immigrants. However, college-educated natives are less likely to work in the same occupation with college-educated immigrants; Natives are primarily employed as professionals, clerks, and sales workers, while approximately 60 percent of immigrants are a craft, assembling and elementary workers.

Table 2.1. Education and Experience of Natives and Immigrants

	2012		2018	
Education	Natives	Immigrants	Natives	Immigrants
Less than High School	6.1	23.4	3.0	23.2
High School Graduates	36.2	48.9	33.0	43.7
College graduates	57.7	27.7	64.0	33.2
Experience	Natives	Immigrants	Natives	Immigrants
1-5	5.8	8.9	5.9	7.3
6-10	12.2	19.6	11.4	20.0
11-15	15.0	18.4	13.4	20.4
16-20	15.4	15.2	14.9	16.7
21-25	15.7	11.8	14.7	10.4
26-30	13.9	9.6	15.2	9.2
31-35	12.5	9.1	13.6	7.7
36-40	9.5	7.5	11.0	8.3

Source: Authors' calculation, RES and SILC-LF, 2012–2018.

Table 2.2. Occupational Distributions of Natives and Immigrants

	Natives			Immigrants		
	High School Dropouts	High School Graduates	College Graduates	High School Dropouts	High School Graduates	College Graduates
Managers	0.1	0.8	3.6	0.1	0.2	4.0
Professionals	1.2	3.8	32.3	0.4	0.8	24.3
Clerks	2.2	9.5	24.5	0.5	0.9	6.1
Service	5.0	6.7	6.0	4.3	4.0	3.4
Sales	5.9	11.3	10.4	0.8	1.0	2.5
Skilled agricultural	7.0	3.0	1.1	5.9	2.7	1.3
Craft workers	25.8	21.9	8.3	20.2	19.3	10.8
Assembling workers	29.1	31.0	10.0	33.0	42.4	28.8
Elementary workers	23.8	12.0	3.8	34.7	28.8	18.9

Source: Authors' calculation, RES and SILC-LF, 2012–2018.

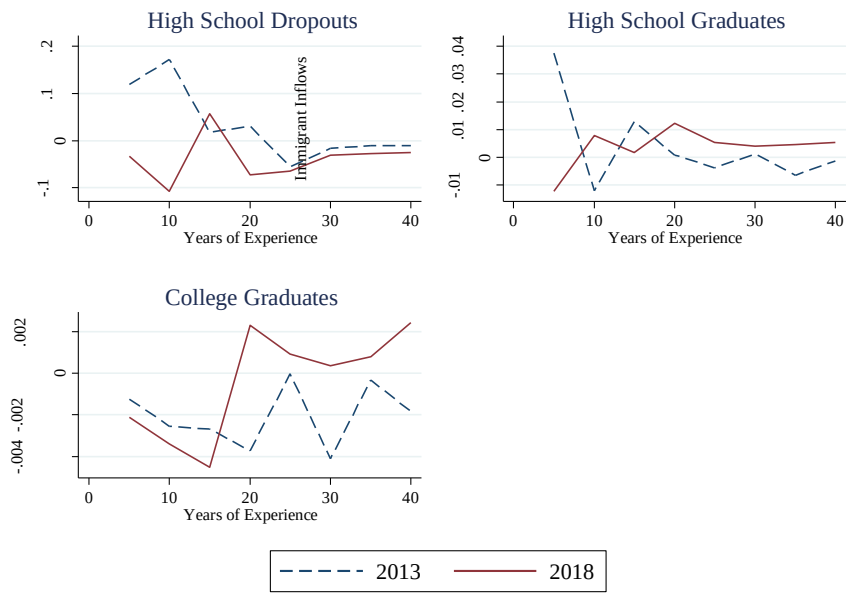
Immigration inflows experienced by natives with education *e* and experience *x* at year *t* can be measured by m_{ext}:

(2.1) $$m_{ext} = \frac{M_{ext} - M_{ext-1}}{M_{ext-1} + N_{ext-1}} = \frac{\Delta M_{ext}}{L_{ext-1}} ,$$

where M_{ext} and N_{ext}, respectively, represent the numbers of hours worked by immigrants and natives in the skill cell *(e,x,t)*. Figure 2.1 displays the immigrant inflows by education groups for 2013 and 2018. There is certainly substantial variation across skill groups to find out how immigrant inflows affect native labor outcomes. Particularly, the inflows are more dispersed within the least-educated,

from 20 percentage points increase to 10 percentage points decrease, in stark contrast to relatively mush less fluctuation for college educates. Also, it is observed that the influx of immigrants with lower years of experience is mostly up for high school dropouts and graduates. For college-educated, inflows of more experienced immigrants are noticeable.

Figure 2.1. Immigrant inflows in skill group



Source: Authors' calculation, RES and SILC-LF, 2013–2018.

We run the regression for the entire sample and separately for three education groups. The empirical analysis estimates the following regression model:

$$\Delta y_{ext} = \beta m_{ext} + \varphi_{FE} + \epsilon_{ext}, \quad (2.2)$$

where Δy_{ext} is changes in the mean of log monthly wages, mean of log hourly wages, numbers of hours worked (standardized by total hours worked) by natives in the *(e,x,t)* cell, m_{ext} is the immigrant inflow. φ_{FE} is the education, experience, and time fixed effects, as well as interaction between education and time fixed effects, experience and time fixed effects, and education and experience fixed effects for the entire sample to absorb the unobserved labor demand shocks to different education/experience groups. The regression for subsample analyses includes experience and time fixed effects. Fixed effects help to control for any systematic differences in growth in labor market outcomes across skill groups and time.[15][16] Also, time-invariant factors which affect the level of variables are accounted for because we use first-differenced variables. ϵ_{ext} is a zero-mean random error term.

In Bojras (2003) and other replication studies, the immigrants share, the fraction of immigrants in the particular skill group, is preferred as an explanatory variable, but this specification can be biased due to endogenous native flows. Even worse, if the dependent variable is native employment, it forces an artificial negative correlation between the dependent and explanatory variables (Peri and Sparber, 2011; Card and Peri, 2016). Thus, we follow Card and Peri (2016)'s specification where

[15] Given the possibility that impacts of demand shocks the set of fixed effects do not perfectly absorb the impact of time-varying skill group-specific demand shocks, we additionally include interaction between education, time and ten-year experience groups for entire sample and interaction between time and ten-year experience groups for subsample following Ortega and Verdugo (2014). Our results are robust to inclusion of skill-year fixed effects.

[16] Korean government accept considerable number of immigrant workers on an E-9 visa to ease the labor shortage and about half of immigrants in our samples are workers with an E-9 visa. It is likely that they are mostly affected by labor demand, thus we perform the robustness test after excluding immigrant workers with an E-9 visa. The results are qualitatively similar to baseline results.

the explanatory variable is the immigrant inflows that would not generate spurious correlation.

2.4. Empirical Evidence

2.4.1. Results

Figure 2.2 provides a preliminary look at the data about the relationship between changes in the labor market outcomes of natives and immigrant inflows. Each point represents an observation of education-experience cell, with dark shading of an individual point implying greater weight, defined as the total employment of a cell. At first, the figure illustrates again the sufficient dispersion for identification and these do not appear to be driven by specific outliers. The scatter diagrams of changes in log monthly wages and log hourly wages, and labor supply of natives versus immigrant inflows from a simple ordinary least squares estimation provide negative correlations. Figure 2.3 shows the scatter plot separately for high school dropouts (Panel A) and college graduates (Panel B) and they reveal that wage effect is highly heterogeneous across education groups. There is a negative correlation between immigrant inflows and wages for low-educated, but the opposite results appear for high-educated.[17]

[17] We also depict the scatter diagram relating residuals from regression of the native labor market outcome or immigrant inflows on vectors of one-way and two-way fixed effects, and they show the similar patterns with Figure 2.2 and 2.3.

Figure 2.2. Scatter Plot Relating Native Labor Market Outcome and Immigrant Inflows

Note: Each observation represents the yearly change in the native labor market outcome in education-experience cell and the corresponding immigrant inflows. The shading of an individual observation indicates the weight of a skill group defined as total employment, with dark shading of an individual point implying greater weight.
Source: Authors' calculation, RES and SILC-LF, 2013–2018.

Figure 2.3. Scatter Plots Relating Native Labor Market Outcome and Immigrant Inflow, Restricted to High school Dropouts or College Graduates

A. High School Dropouts

B. College Graduates

Note: Refer to Figure 2.2
Source: Authors' calculation, RES and SILC-LF, 2013–2018.

Table 2.3 reports the coefficient estimates of Equation (2.2). We weight each skill cell by its total employment and standard errors are adjusted for clustering within skill cells to account for the possibility of serial correlation. Negative wage and employment effects for the entire sample turn to be statistically insignificant after controlling a set of fixed effects. Columns 2-4 in Table 2.3 show the estimates when restricting the cells including high school dropouts (Column 2), high school graduates (Column 3), or college graduates (Column 4). Results for wage effects disaggregated by education groups are in line with the descriptive findings.[18] The estimate for low-educated exhibits a negative sign. The point estimates in Column (2) indicate that the wage growth rate fall by about 0.2-0.3 p.p. for 1 p.p. increase in the immigrant share in a skill group. On the other hand, immigrant inflows are found to be positively associated with wages for college graduates. The magnitude of coefficient estimates is larger than low-educated, showing the 1.3-1.4 p.p. increase in wage growth rates with 1 p.p. increase in immigrant shares. We find no effects on the wages of high school graduates. The detrimental effects of immigration are concentrated among the least-educated natives. Regarding the employment effects, the insignificant effects are observed for all education groups.

[18] Also, we explore the possibility that effects vary by experience, but the coefficients are found to be insignificant for all separate experience groups, implying no heterogeneity across experience groups.

Table 2.3. Impact of Immigrant Inflows on Natives' Wages and Employment

Dependent Variables	(1) All	(2) High School Dropouts	(3) High School Graduates	(4) College Graduates
Log Monthly Wage	-0.038	-0.231*	0.421	1.256**
	(0.110)	(0.098)	(0.236)	(0.373)
Log Hourly Wage	0.019	-0.195*	0.462	1.435**
	(0.140)	(0.098)	(0.396)	(0.470)
Native Employment	0.064	-0.147	-0.393	-1.448
	(0.310)	(0.280)	(0.539)	(1.920)
Observations	144	48	48	48

Note: The table report the coefficients of the immigrant inflows from regressions where dependent variables are the yearly change of log monthly wage, log hourly wage, and number of hours supplied by natives for the period 2013-2018. The regression reported in Column 1 include the education, experience, and time fixed effects, as well as interaction between education and time fixed effects, experience and time fixed effects, and education and experience fixed effects. The regression reported in Column 2-4 include experience and time fixed effects. Standard errors are reported in parentheses and are adjusted for clustering within education-experience cells (in Column 1) and within experience cells in (Column 2-4). *, ** and *** denote significance at, respectively, 10%, 5% and 1% level.
Source: Authors' calculation, RES and SILC-LF, 2013–2018.

We also perform the robustness test to check the sensitivity of our main results. The results are shown in Table 2.4. First, we include both male and female when measuring the immigrant inflows. Women tend to have a more discontinuous career than men, thus the classification into age-based experience cells may be inaccurate (Borajs, 2003; Ottaviano and Peri, 2012; National Academies of Sciences, Engineering, and Medicine, 2017). In spite of the imprecise classification of women, the results are similar and coefficients are larger than baseline results. Second, we use population instead of hours worked to measure labor supply as the population is

a more exogenous source of variation and non-employment itself also can affect native labor market outcome (Manacorda et al., 2012). Overall, using the population as labor supply does not change the results, nonetheless, the coefficient on hourly wages for high school dropouts becomes insignificant. Third, data for part-time workers are included. They have weak labor market attachment and their wage can introduce non-classical measurement error (Ottaviano and Peri, 2012). When including part-time workers, the results are much comparable to the main results, except for positive wage effects for high school graduates. Fourth, we change regression weights from total employment to the inverse of the sampling variance of the dependent variable (Borjas et al., 2012), and it yields qualitatively similar estimated coefficients. Last, we calculate the labor supply by summing up the count of employed people, instead of hours worked in a cell. The results still show the negative wage effects for high school dropouts and positive effects for college-educated. On the whole, the results are virtually robust to alternative sample selection and specification.

Table 2.4. Robustness Check

Dependent Variables	(1) All	(2) High School Dropouts	(3) High School Graduates	(4) College Graduates
A. Baseline				
Log Monthly Wage	-0.038	-0.231*	0.421	1.256**
	(0.110)	(0.098)	(0.236)	(0.373)
Log Hourly Wage	0.019	-0.195*	0.462	1.435**

	(0.140)	(0.098)	(0.396)	(0.470)
Native Employment	0.064	-0.147	-0.393	-1.448
	(0.310)	(0.280)	(0.539)	(1.920)
B. Includes women in labor supply				
Log Monthly Wage	-0.110	-0.367**	0.627	1.547**
	(0.169)	(0.123)	(0.447)	(0.579)
Log Hourly Wage	-0.024	-0.335*	0.559	2.323***
	(0.189)	(0.174)	(0.621)	(0.393)
Native Employment	0.282	0.035	-0.688	-1.630
	(0.373)	(0.246)	(0.695)	(1.626)
C. Population instead of hours worked				
Log Monthly Wage	-0.066	-0.239**	0.456	1.519**
	(0.127)	(0.099)	(0.368)	(0.460)
Log Hourly Wage	0.000	-0.220	0.517	2.167**
	(0.235)	(0.186)	(0.506)	(0.773)
Native Employment	0.182	0.138	-0.713	-0.154
	(0.345)	(0.209)	(0.446)	(1.394)
D. Includes part-time workers				
Log Monthly Wage	0.123	-0.144	0.473**	1.670***
	(0.127)	(0.249)	(0.172)	(0.330)
Log Hourly Wage	-0.176	-0.289***	0.371	1.597**
	(0.125)	(0.073)	(0.430)	(0.583)
Native Employment	-0.157	-0.176	-0.465	-1.448
	(0.238)	(0.299)	(0.509)	(1.863)
E. Weighted by variance of the dependent variable				
Log Monthly Wage	-0.032	-0.234*	0.357	1.221**
	(0.110)	(0.109)	(0.231)	(0.420)
Log Hourly Wage	0.016	-0.199*	0.428	1.336**
	(0.131)	(0.085)	(0.372)	(0.498)

Native Employment	0.146	-0.078	-0.707	-1.218
	(0.356)	(0.313)	(0.697)	(2.006)
F. Labor supply measured as employment				
Log Monthly Wage	-0.061	-0.267**	0.395	1.403**
	(0.117)	(0.098)	(0.257)	(0.427)
Log Hourly Wage	0.019	-0.206	0.444	1.624**
	(0.150)	(0.113)	(0.410)	(0.571)
Native Employment	0.160	-0.099	-0.245	-1.451
	(0.293)	(0.266)	(0.474)	(1.956)
G. Skill-year FE: Four experience groups				
Log Monthly Wage	-0.145	-0.329**	0.335	1.191**
	(0.171)	(0.134)	(0.239)	(0.403)
Log Hourly Wage	0.02	-0.212	0.549*	1.160**
	(0.213)	(0.129)	(0.264)	(0.445)
Native Employment	0.000	-0.180	0.752	-0.405
	(0.391)	(0.349)	(0.425)	(2.207)
Observations	144	48	48	48

Note: Refer to Table 2.3
Source: Authors' calculation, RES and SILC-LF, 2013–2018.

2.4.2. Discussion

The results presented in the previous subsection suggest that overall we found no impact on wage and employment. In the subgroup analysis, inflows of immigrants reduce the wages of least-educated natives, while they have positive impacts on the wages of high-educated. This finding can be accounted for the difference in the degree of substitution between natives and immigrants across education groups. It seems that the substitutability of immigrants for natives is greater for the less-

educated group.[19]

In order to investigate the similarity in occupational distribution between natives and immigrants, we use Welch (1999)'s congruence index defined by

$$C_{nf} = \frac{\sum_o (q_{no} - \overline{q_o})(q_{fo} - \overline{q_o})/\overline{q_o})}{\sqrt{(\sum_o (q_{no} - \overline{q_o})^2/\overline{q_o})(\sum_o (q_{fo} - \overline{q_o})^2/\overline{q_o})}}, \tag{2.3}$$

where q_{no} and q_{fo} respectively give the share of natives and immigrants in occupation o (at one-digit level), and $\overline{q_o}$ gives the share of workers in occupation o. This index equals one if the occupational distributions of two groups completely overlap and minus one if natives and immigrants work in totally different occupations. We aggregate workers into ten-year experience intervals, instead of five-year intervals, to have sufficient observations in each occupation-education-experience cell. Table 2.4 present the calculated congruence index using SILF-LC and RES over 2012-2018. Remarkably, there are significant differences in congruence values across education groups. The indices for high school dropouts are close to one. In particular, consider workers with 30 years of experience or under. The congruence index is 0.998-0.999, suggesting the natives and immigrants have almost identical occupation distributions. In the case of high school graduates, the similarity is high for young workers, whereas older groups have negative congruence values. Lastly, it seems that college-educated natives and immigrants are clustered

[19] Orrenius and Zavodny (2007), using occupation as a proxy for skill, allow immigrant substitutability to differ by skill and find that negative wage effects are concentrated among low-skilled, blue-collar occupations.

in different occupations, except for workers with 31-40 years of experience. This might be due to the fact that the considerable number (40%) of college graduate immigrants come to Korea with non-professional working visas which makes them confined to blue-collar positions. In sum, it is inferred that substitution is easier with least-educated workers and this finding provides an important mechanism to explain the heterogeneous immigration effect by education level.

Table 2.4. Congruence Index

Education-Experience of native group	Experience of corresponding immigrant group			
	1-10 years	11-20 years	21-30 years	31-40 years
High School Dropouts				
1-10 years	**0.999**	0.996	0.998	1.000
11-20 years	0.999	**0.998**	0.999	1.000
21-30 years	0.995	0.999	**0.998**	0.995
31-40 years	0.650	0.689	0.675	**0.639**
High School Graduates				
1-10 years	**0.946**	0.949	0.946	0.944
11-20 years	0.736	**0.740**	0.717	0.711
21-30 years	0.004	0.005	**-0.039**	-0.051
31-40 years	-0.048	-0.050	-0.095	**-0.108**
College Graduates				
1-10 years	**-0.069**	-0.073	-0.071	-0.068
11-20 years	-0.516	**-0.503**	-0.498	-0.494

21-30 years	-0.197	-0.171	**-0.167**	-0.164
31-40 years	0.102	0.127	0.129	**0.132**

Note: The table report the index of congruence and it is calculated separately for each education-experience pair of natives and immigrants.
Source: Authors' calculation, RES and SILC-LF, 2013–2018.

Also, while we found the immigration is harmful to least-educated, the magnitude of coefficients is smaller compared to that of the positive effects for highly educated; with 1 p.p. increase in the immigrant share in a skill group, the wage growth rate for high school dropouts decline by 0.2-0.3p.p. and rise for college graduates by 1.3-1.4 p.p. This is due to fact that least-educated immigrants are mostly employed in sectors where labor shortage occurs. Non-professional working visas (40%) and work visits (30%), for ethnic Koreans, both of which are aimed to fill the labor shortages, comprise 70% of high school dropout immigrants. The immigration influx does not induce large negative effects on native labor market outcomes in the sectors facing labor shortages. Hence, the detrimental wage effects for least-educated native is relatively small in a magnitude although they work in almost the same occupations with least-educated immigrants.

2.5. Conclusion

This paper investigates how inflows of immigrants are associated with the natives' labor market outcome during the period 2012-2018 by using the variation in the education-experience cell. Results reveal that wage and employment are unaffected

by immigrant inflows, on average. We also estimate the regression within education groups to allow the immigration effect to vary, and observe a great heterogeneity, with negative wage effects for least-educated and beneficial effects for highly educated. Our results are shown to be robust to different sample selection and specification.

An important explanation for these results is whether there is an overlap between the occupational distribution for natives and immigrants in each education group. We provide the suggestive evidence on the different degrees of substitution across education groups: least-educated natives are very highly likely to be employed in the same occupation with corresponding immigrants, but on the contrary, college-educated natives and immigrants work in different segments of occupation even having the similar education.

Our regression estimates capture the direct own-group effect of immigration inflows on natives' wages and employment within a skill-cell given labor supply in other skill cells constant, yet the approach we employ omits the indirect cross-group effects. Immigration inflows can affect not only labor market outcomes of natives with similar skills, but also affect those of natives with dissimilar skills. Therefore, future research is needed to identify the total effect on natives which aggregates the direct effects plus cross-effects using a structural approach.

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Chapter 3. Do High Wage Migrants Leave Faster? Selective Out-migration among Immigrants in Korea

3.1. Introduction

Over recent decades, immigration has been accompanied by very substantial out-migration. In OECD countries, 20% to 50% of immigrants emigrate within five years after their arrival, either for their home country or third-country destinations (Dumont and Spielvogel, 2008). Borjas and Bratsberg (1996) found about 20% of immigrants who arrived between 1975 and 1980 left the U.S for the same period, while Jasso and Rosenzweig (1982) found that the emigration rate for USA immigrants for 1971 arriving cohort could have been as high as 50 percent. Aydemir and Robinson (2008) report the estimated outmigration rate of around 35% within 20 years of arrival in Canada. Similar patterns emerge for immigrants to European countries (e.g. Edin et al. (2000) for Sweden, Dustmann and Weiss (2007) for the UK, Jensen and Pedersen (2007) for Denmark, Bijwaard (2010) for the Netherlands)

Moreover, out-migration is not a random process and such nature of out-migration affects the characteristics of those who remain. It has several important implications for policymakers and researchers. First, it is crucial to explore the nature of selective emigration as it can help to assess the economic and social integration into the host country's society and implementation of migration policies (Kuhlenkasper and Steinhardt, 2017). Out-migration also can affect the immigration effect on native

wages and employment and the way affects native labor market outcome relies on who leaves and where emigrants are located in the native wage distribution (Dustmann and Görlach, 2016). Besides, Selective return migration can affect has the fiscal contribution and consumption of social service of immigrants (Reagan and Olsen, 2000) Lastly, unless selective emigration is taken account, the estimated parameter of immigrants' wage assimilation profiles can be biased (Dustmann 1993; Hu 2000; Lubotsky 2000).

Especially in Korea where the demand for the immigrant workforce is expected to increase due to a decline in working population and growth in the immigrant population is rapid, understanding the determinant of out-migration is more important. In terms of labor migration, the Korean government has two opposite policy initiatives: the principle of temporary circular migration of low skilled versus rapid access to permanent status for high skilled (OECD, 2019). Despite the importance of accurate research on selectivity in out-migration in Korea, empirical evidence is rare due to data limitation. In fact, even in traditional immigration-receiving countries, it is challenging - and often even infeasible – to measure emigration, thus temporariness of migration has been often ignored in the empirical literature (Dustmann and Görlach, 2016). Most previous studies use longitudinal data that lack exact information on the departure date and only tell whether or not the immigrant still reside in the host country at the interviewed date (Bijwaard, 2010). Moreover, attrition is related to not only out-migration but also mortality. It is related to unsuccessful interviews and unsuccessful tracking of individuals, too (Constant

and Massey, 2003).

Recently, considerable advance has been made in this issue by linking the administrative and survey data, mainly in Northern European countries (see e.g., Bijwaard et al. (2014) for the Netherlands, Sarvimäki (2011) for Poland, Bratsberg et al. (2007) for Norway, Nekby (2006) for Sweden). Our paper adds to the literature on the selectivity of out-migration by using comprehensive and better data. The administrative data we use recode the exact date of registration and departure and we match this information to the survey data that provides the wide-ranging demographic and labor market characteristics. The additional contribution and novelty of this paper is to focus on newly-emerging immigration-receiving in Asia given that this area usually focuses on the Western countries.

Specifically, our paper examines whether emigrants from Korea are positively or negatively selected in terms of wages in Korea. Using administrative data and microdata from the Survey on Immigrant's Living Conditions and Labour Force (SILC-LF), we find no statistically significant relationship between wages and out-migration for the whole sample. We also investigate how the direction of selection in emigration varies by region of origin and visa type (migration motives). Emigration patterns for Non-Asian or highly qualified immigrants are found to be different for Asian or non-professional immigrants. The estimation results suggest that non-Asian or highly qualified immigrants with high wages leave Korea faster while there is no association between wages and out-migration for Asian or non-

professional immigrants.

The rest of this paper proceeds as follows. The next section reviews some related literature. Section 3.3 describes the matched administrative and survey data and introduces the empirical model. Section 3.4 presents the empirical results. Sections 3.5 discuss policy implications states our conclusion.

3.2. Literature Review

Several theoretical predictions suggest how skills are associated with out-migration and most of them focus on return migration.[20] Borjas and Bratsberg (1996) see the return migration as the part of optimal residential plan over the life cycle and point out the return to skills in the host country relative to that in source country determines the direction of selection. When the rate of return is higher (lower) in the host country, emigrants are positively (negatively) selected from the source country and returnees will be (positively) negatively selected among immigrants. The migration selection in this model depends only on the relative return, yet other factors affect the out-migration decisions such as high purchasing power of host

[20] Not a few immigrants whose skills globally transferable could emigrate to a third-country destination, defined as onward migration if returns there are higher than that in the host and source country. Theoretically, onward migration may also be a part of the same optimal location plan. It can be motivated by new information available in the host country about economic opportunities of previously unconsidered regions (Nekby, 2009). Or, migrants often use the initial destination as the stepping stone to their final destination (Takenaka, 2007). The empirical literature on the selection of onward migration is also scarce since delineating between return and onward migration require very detailed data. Nekby (2009), studying the emigration of immigrants from Sweden, finds that emigrants have higher adjusted mean income levels than non-emigrants up to the age of 40 while onward migrants have lower predicted income levels across the age distribution.

country currency in the source country and high preference for the home country, thus the selection in out-migration from distribution of skills might be not conclusive.

In regards to the relation between out-migration and wages in the host country, Dustmann (2003) argues that wages affect the decision to emigrate through substitution and income effect. On one hand, the wage increase makes migrants stay longer in the host country as returns become more costly. On the other hand, if the total lifetime income increase with a rise in wages, migrants become reduce the duration of overseas as they reach their goals more quickly, leading to a reduction in the value of remaining in the host country. Hence, the wage effect of return migration is theoretically ambiguous. Empirical researches that study the relationship between wages and out-migration show mixed results. Borjas (1989) finds that return migrants are negatively selected using earning data for high-skilled. On the contrary, Dustmann (2003) using microdata for Germany report that the migration duration became shorter as wages in the host country get higher, except at very low levels of wages. Bijwaard and Wahba (2014)'s results for The Netherlands reveal that return intensities are U-shaped with respect to initial income with high intensity for low- and high-income groups. However, Constant and Massey (2003) and Gibson and Mckenzie (2011) find that migration returns do not respond to earnings in the host country. Our paper extends to literature by examining the selection in out-migration in the newly-emerging immigration-receiving country in Asia and using more accurate data than that in much literature. We allow the direction of selection to vary by area of origin. Also, Results disaggregated by visa type are provided considering

the heterogeneity in terms of immigration policies for each group.

3.3. Data and Empirical Framework

3.3.1. Data Sources and Sample Construction

This paper relies on individual records of migration from the ICRM (Immigration Customer Relationship Management) database created by the Korean Immigration Service. All foreigners to Korea are registered in the ICRM database and included information is the full migration history to and from Korea, Alien Registration Number, which contains information on gender, date of birth, visa type, source country, and other personal data. This database covers the *entire population* of immigrants and each individual is followed by until 31 May 2019 for data we used. We merge the administrative records to microdata collected in the SILC-LF for the years 2017-2018, of which the target population is immigrant aged over 15 and staying in Korea longer than 90 days. This survey contains information about labor market status (monthly wage, working hours a week, industry, occupation, other job characteristics), socio-demographic characteristics (age, gender, education, marital status, a region of residence), and migration-specific information (years since migration, visa type, source country). We restrict the samples with positive monthly wages and working hours.

In the linkage process, one can use variables that included in microdata and which also appear in the administrative data. At first, respondents in the 2017 and 2018

SILC-LFs are linked by personal characteristics; date of birth, sex, source country, and visa type. Since linkage is not performed based on a unique individual identifier but by means of ambiguous identifiers, a match is not unique. The matching variables have high accuracy but they also have relatively low discriminatory power except for the date of birth.[21] For this reason, we use a year of entry as the additional matching variable in the second stage to reduce multiple potential matches despite measurement errors in survey responses to retrospective questions. We used only exact (deterministic) matching, and finally, approximately 47% of the whole sample of 2017 and 2018 SILF-LCs are exactly matched, yielding a final matched sample size of 6,181.

As particular subgroups of administrative records are more or less likely to be successful for matching, resulting in selection bias, weights are adjusted for the matched sample to reproduce the characteristic of the full sample following Lubotsky (2007). First, let w_i be the population weight provided in the SILC-LF for an immigrant i and $p(x_i)$ reflects the matching probability for an immigrant with observable characteristics. Then, the adjusted weight is calculated by $w_i/\hat{p}(x_i)$. A logistic regression model is used to estimate the matching probability where the explanatory variables are age, age squared, male dummy, college-educated dummy, marital status dummies, area of origin dummies, a dummy for residence in Seoul

[21] The number of immigrant population who resided in Korea during the interview date for 2017-2018 is 1,333,595 while the number of samples for 2017 and 2018 SILC-LFs is 13,270, so duplicates can arise in spite of the use of date of birth as the matching variable.

Metropolitan Area, occupation dummies, regular worker dummy, and log of monthly wages.

Table 3.1 compares the socio-demographic characteristics of full, matched, and reweighted samples. Overall, matched samples are more likely to be females, college-educated, white-collar, Asian, and immigrants with higher wages than full samples (Column 1 and 2 of Table 3.1). It might be because these subgroups are less common in the full sample given the fact that we only use single and exact matching. No significant differences were found between full and reweighted samples based on socio-demographic variables when accounting for the selectivity of matching (Column 1 and 3 of Table 3.1), indicating considerable similarity between two samples.

Table 3.1. Socio-Demographic Characteristics of Full, Matched, and Reweighted Samples

	(1)	(2)	(3)	(4)	(5)
	Full sample	Matched sample	Reweighted sample	(2)-(1)	(3)-(1)
Male	0.678	0.651	0.685	-0.027***	0.007
College	0.317	0.41	0.327	0.093***	0.010
Professionals and Clerks	0.102	0.164	0.098	0.062***	-0.004
Asia	0.922	0.86	0.923	-0.062***	0.001
Log monthly Wage	5.248	5.256	5.247	0.008***	-0.001
Observation	13270	6181	6181		

Source: Authors' calculation, ICRM and SILC-LF, 2017–2018.

3.3.2. Empirical Framework

To examine how wages in Korea affect the migration duration, we employ a

classical Cox proportional hazard model (Cox, 1972), the semiparametric duration model. Though there are several techniques to analyze the emigration behavior such as OLS and binary dependent regression model, we chose to use the duration model given that censoring is not accounted for and time-varying covariates cannot be handled in OLS and one could lose a large amount of information, for example, the length of stay, in binary dependent regression model (Jenkins, 2005). Cox's model specifies that

$$h(t, X_i) = h_0(t)\exp(X_i'\beta) \qquad (3.1)$$

where $h(t, X_i)$ is the hazard rate at time *t* for individual *i* and $h_0(t)$ is the baseline hazard function and X_i is a vector of characteristics of individuals.

We suppose that X_i is constant and only use time-invariant covariates in our paper, but note that the Cox approach can actually accommodate the time-varying variables. The Cox model provides a method for estimating coefficients β without requiring any functioning form for baseline hazard function. This partial likelihood estimator is popular since it is a reasonable compromise between non-parametric estimator (Kaplan-Meier estimator) and excessively structured parametric models (Greene, 2003)[22]. Note that the coefficients estimates indicate how covariates are associated with migration duration, rather than causal effects since our specification does not account for unobserved individual heterogeneity.

[22] In the robustness checks, we also present results obtained from parametric (Weibull) models.

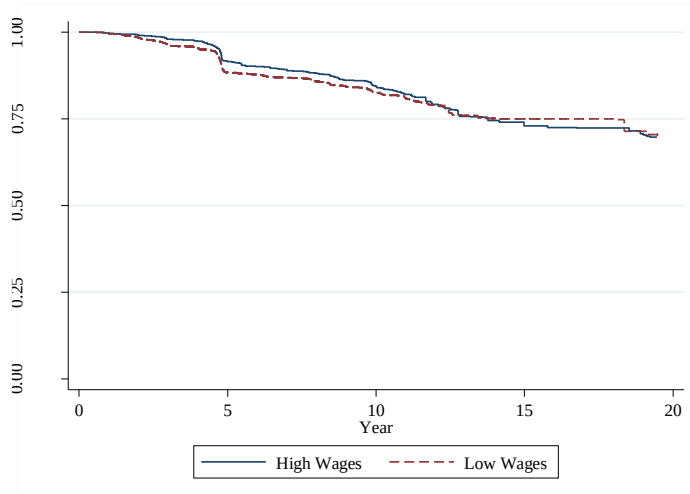
The dependent variable is the length of duration measured in days and personal characteristics include age at the interviewed date, age of migrants at entry, male dummy, marital status dummies (not married, married with Koreans, married with non-Korean who lives in Korea, and married with non-Korean who lives abroad), area of origin dummies (Korean-Chinese, Vietnam, other Asians, America, Europe, Oceania, Africa, and others), dummy for residence in Seoul Metropolitan Area, and log of monthly wages.[23] We test the robustness of our main results by adding the potential confounding factors that affect wages such as college-educated dummy and dummy for professionals and clerks.

Before turning to the Cox analysis, we provide the Kaplan–Meier estimates of the survival functions by wage groups of immigrants to gain the first impression of the nature of selection. High wage groups refer to immigrants whose wages are above the average wages and low wage groups are below-average wage earners. On average, two groups have similar surviving probabilities (Figure 3.1). When we divide the whole sample into Asian and Non-Asian and Japanese immigrants (Figure 3.2), we observe that Non-Asian and Japanese with high wages have lower surviving probabilities especially after 10 years of residence. Figure 3.3 shows the survival curve by income group for each visa type and we can observe considerable heterogeneity. While immigrants coming to Korea as students stay longer as wages increase, the duration in Korea for skilled workers and others gets shorter with wages.

[23] Korean-Chinese (ethnic Korean in China) and Vietnam are the top two source countries of the Korean immigrant population.

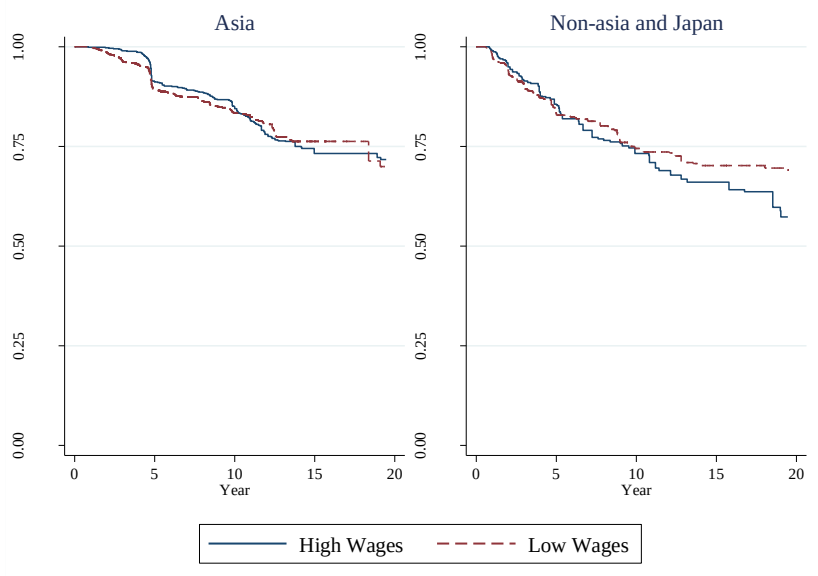
For temporary non-professional employment visa holders and long-term residents, there are no significant differences in surviving probabilities between two wage groups as in the whole sample.

Figure 3.1. Kaplan-Meier Curve by Wage Groups



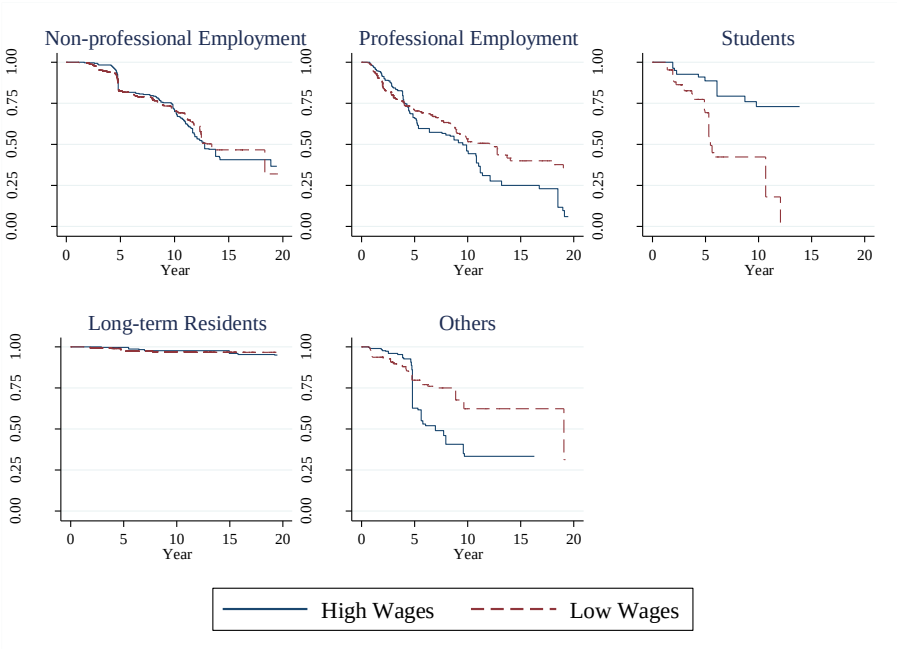
Source: Authors' calculation, ICRM and SILC-LF, 2017–2018.

Figure 3.2. Kaplan-Meier Curve by Wage Groups (Separately for Asian and Non-Asian and Japanese)



Source: Authors' calculation, ICRM and SILC-LF, 2017–2018.

Figure 3.3. Kaplan-Meier Curve by Wage Groups (Separately for Each Visa Type)



Source: Authors' calculation, ICRM and SILC-LF, 2017–2018.

3.4. Results

3.4.1. Main Results

Table 3.2 presents the estimates of the effects of wages on the hazard of leaving Korea the reported values are hazard ratio, the exponential value of coefficients. A hazard ratio greater than one suggests the out-migration hazard increase as the value of a covariate increase, whereas hazard ratios less than one imply a covariate is negatively associated with hazard rate. On average, we find no significant relationship between wages and out-migration from Korea, confirming the results of

Kaplan-Meier estimates in the previous section. The results by source country and visa type indicate that there is substantial heterogeneity. Non-Asian and Japanese immigrants who leave from Korea have higher wages than those who remain. Professional employee emigrants are also positively selected among all professional employee immigrants. Furthermore, the effect size is quite large; out-migration hazard increases by 13.5% with a 10% increase in wages for Non-Asian and Japanese immigrants and increases by 5.2% for professional employees.[24] A rise in wages plays a very minor role in the decision to leave for Asian, non-professional, student, and long-term resident immigrants.[25][26]

Next, we discuss other relevant results. The younger the immigrants arrive in Korea, the lower their out-migration hazard will be. Migrants married with Koreans are 90% less likely to leave Korea than non-married migrants, while out-migration hazard is higher for migrants married with non-Korean who lives abroad than non-married. This is in line with the literature that emphasizes the relationship between out-migration decision and family-related factors (Bijwaard, 2010; Gibson and Mckenzie, 2011; Van hook and Zhang, 2011) Also, we find that Korean-Chinese and

[24] The hazard ratio is an estimate of the change of the hazard for a unit increase in the covariate when the covariate is a numerical variable. Note that a 10% increase in monthly is the same as a $\log(1.1) = 0.095$ increase in the variable, so the hazard ratio is $\exp(0.095\beta)$ in this case.

[25] Additionally, we estimate separate Cox regression for each of initial visa type. The results indicate that wages and out-migration hazard are not associated except for "others". Therefore, it can be inferred that positive selection in out-migration for professional employees are largely driven by those who changed their visa to professionals, not those who came to Korea with a professional visa at first.

[26] We also check for possible non-linear relationship between wages and out-migration hazard, and results indicate that wages for professional employees in Korea has a U-shaped effect on the out-migration hazard as both professional immigrants with bottom 25% and top 25% of wages leave faster.

Vietnamese immigrants have lower propensity to leave Korea while American and African immigrants are more prone to leave, compared to other Asian immigrants. This pattern is partly in line with the general picture in Dustmann and Görlach (2016) who combined the estimates from empirical studies for selective out-migration by origin country. They suggest migrants from America, Europe, Oceania have higher emigration rates than migrants from less developed countries, in particular, those in Africa and Asia.

Table 3.2. The Effects of Wages on Out-migration Hazard

	(1)	(2)	(3)	(4)
		Area of Origin		Visa Type
VARIABLES	All	Asia	Non-Asia and Japan	Non-professional
Log monthly wage	1.232	0.906	2.363***	0.797
	(0.165)	(0.149)	(0.348)	(0.210)
Age	0.339***	0.339***	0.343***	0.352***
	(0.011)	(0.013)	(0.020)	(0.016)
Age at entry	2.937***	2.939***	2.795***	2.858***
	(0.098)	(0.111)	(0.165)	(0.130)
Male	0.932	1.003	0.854	1.035
	(0.128)	(0.161)	(0.181)	(0.207)
Marital Status				
Married with Koreans	0.103***	0.092***	0.124***	1.511
	(0.039)	(0.045)	(0.065)	(1.361)
Married with non-Koreans who lives abroad	1.284**	1.303**	0.873	1.114
	(0.155)	(0.170)	(0.261)	(0.160)
Married with non-Koreans who lives in Korea	0.856	0.891	0.696	1.105
	(0.143)	(0.174)	(0.181)	(0.271)
Area of Origin				
Korean-Chinese	0.287***	0.277***		0.356***

	(0.051)	(0.053)		(0.081)
Vietnam	0.597***	0.599***		0.422***
	(0.112)	(0.112)		(0.108)
America	1.415*		0.439***	
	(0.264)		(0.129)	
Europe	1.115		0.384***	1.236
	(0.204)		(0.111)	(0.856)
Oceania	0.709		0.333**	
	(0.353)		(0.147)	
Africa	2.003**		0.655	
	(0.679)		(0.262)	
Living in Seoul Metropolitan Area	0.838*	0.896	0.499***	0.822
	(0.085)	(0.100)	(0.106)	(0.100)
Observations	6,181	5,126	1,055	2,683

Table 3.2. Continued

	(5)	(6)	(7)	(8)
		Visa Type		
VARIABLES	Professional	Students	Residents	Others
Log monthly wage	1.522***	0.627	0.861	1.508
	(0.229)	(0.291)	(0.501)	(0.843)
Age	0.312***	0.215***	0.301***	0.303***
	(0.020)	(0.075)	(0.050)	(0.051)
Age at entry	3.146***	5.288***	3.306***	3.293***
	(0.202)	(1.898)	(0.475)	(0.536)
Male	0.770	0.779	1.924	0.653
	(0.160)	(0.433)	(1.180)	(0.430)
Marital Status				
Married with Koreans	0.122***	0.000***	0.977	0.000***
	(0.097)	(0.000)	(0.692)	(0.000)
Married with non-Koreans who lives abroad	0.781	0.000***	0.876	0.985
	(0.211)	(0.000)	(1.384)	(0.400)
Married with non-Koreans who lives in Korea	0.954	1.551	1.531	0.256**
	(0.234)	(1.861)	(1.087)	(0.171)

Area of Origin				
Korean-Chinese			6.385**	2.540
			(5.026)	(2.249)
Vietnam	0.556	0.910	5.242	0.544
	(0.306)	(0.541)	(5.903)	(0.209)
America	1.183	3.749**	4.523	4.825***
	(0.294)	(2.423)	(4.623)	(2.741)
Europe	1.267	0.000***	7.630**	2.779
	(0.342)	(0.000)	(6.623)	(2.941)
Oceania	3.162***		0.000***	
	(1.119)		(0.000)	
Africa	2.014**	0.000***	0.000***	0.461
	(0.661)	(0.000)	(0.000)	(0.412)
Living in Seoul Metropolitan Area	0.761	5.013**	2.033	1.108
	(0.148)	(3.375)	(1.061)	(0.524)
Observations	749	123	2,365	261

Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The reference group is non-married immigrants for 'Marital Status' and other Asians for 'Area of Region'.
Source: Authors' calculation, ICRM and SILC-LF, 2017–2018.

3.4.2. Robustness Check

We now provide robustness checks to test the sensitivity of our main results in Table 3.3. Since our main interest in this paper is to explore whether high or low wage migrants leave faster Korea, only the coefficients for wages are reported in this subsection. First, we add a college-educated dummy, and a dummy for professionals and clerks as controls, which can affect wages. Adding controlling these variables does not change our results qualitatively, yet we observe small changes in point estimates of the hazard ratio. In particular, the coefficient for Non-Asian and Japanese immigrants gets smaller, implying that wages and two controls are positively associated given that professionals and clerks are more prone to leave and

education and out-migration hazards have no relationship for this group. Next, to capture the source country's economic situation, the relative GDP of source country to Korea from the World Bank is also used as an additional control (Bijwaard and Wahba, 2014). Out-migration hazard is higher for immigrants from a richer country and our results on the wage effects remain unchanged.[27] Also, we check the sensitivity of our results by using hourly wages. Working hours are reported within the particular interval in 2017-2018 SILC-LFs, so the midpoints of each interval are used for calculating the hourly wages and it can lead to bias in estimates due to measurement error. Therefore, we chose to use monthly wages in the baseline analysis. Nonetheless, alternative use of hourly wages as an independent variable yields a similar result to baseline results. Lastly, we employ Weibull models instead of the Cox approach and the parametric estimates are very similar to estimates obtained from the Cox model. Although the coefficient for professional employees becomes insignificant, it still displays a positive sign. Also, the estimated parameter for duration dependence is larger than one for all samples and across source country and visa type (not shown). Out-migration hazard increase in duration in Korea, showing strong positive duration dependence. However, we should interpret this parameter with caution considering that endogeneity is not accounted for. Overall, our results are robust across different specifications.

[27] Results on the effect of added control variables are available upon request.

Table 3.3. The Effects of Wages on Out-migration Hazard (Robustness Check)

	(1)	(2)	(3)	(4)
		Area of Origin		Visa Type
VARIABLES	All	Asia	Non-Asia and Japan	Non-professional
Baseline	1.232	0.906	2.363***	0.797
	(0.165)	(0.149)	(0.348)	(0.210)
Observations	6,181	5,126	1,055	2,683
Adding occupation, education, regular worker dummy	1.176	0.919	1.695***	0.790
	(0.154)	(0.154)	(0.275)	(0.208)
Observations	6,181	5,126	1,055	2,683
Adding relative GDP	1.083	0.892	1.887***	0.789
	(0.143)	(0.144)	(0.298)	(0.208)
Observations	6,181	5,126	1,055	2,683
Use log of hourly wage as a dependent variable	1.462***	1.177	2.194***	0.945
	(0.169)	(0.194)	(0.302)	(0.234)
Observations	6,132	5,084	1,048	2,668
Weibull	1.109	0.819	2.085***	0.793
	(0.148)	(0.131)	(0.300)	(0.227)
Observations	6,181	5,126	1,055	2,683

Table 3.3. Continued

	(5)	(6)	(7)	(8)
		Visa Type		
VARIABLES	Professional	Students	Residents	Others

Baseline	1.522***	0.627	0.861	1.508
	(0.229)	(0.291)	(0.501)	(0.843)
Observations	749	123	2,365	261
Adding occupation, education, regular worker dummy	1.608***	0.675	0.985	1.199
	(0.246)	(0.307)	(0.546)	(0.734)
Observations	749	123	2,365	261
Adding relative GDP	1.491**	0.706	0.808	1.262
	(0.233)	(0.303)	(0.442)	(0.667)
Observations	749	123	2,365	261
Use log of hourly wage as a dependent variable	1.409**	0.952	1.361	3.249***
	(0.200)	(0.564)	(0.732)	(1.352)
Observations	741	121	2,345	257
Weibull	1.237	0.840	0.946	1.681
	(0.201)	(0.372)	(0.515)	(0.946)
Observations	749	123	2,365	261

Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The reference group is non-married immigrants for 'Marital Status' and other Asians for 'Area of Region'.
Source: Authors' calculation, ICRM and SILC-LF, 2017–2018.

3.5. Discussion and Conclusion

This research uses the linked administrative and survey data to analyze the selection in the out-migration of immigrants in Korea in terms of wages in Korea. Our results using the Cox proportional hazard model reveal that the out-migration hazard is not associated with wages for all samples. Separate estimations by area of the region and visa type indicate a great heterogeneity of the effects of wages. While

the same pattern is observed Asian, non-professional employees, students, and residents, Non-Asian and Japanese and professional employee immigrants are found to be positively selected. Specifically, a 10% increase in monthly wages increases out-migration hazard by 13.5% and 5.2% for Non-Asian and Japanese and professional employees, respectively. This is consistent with results in Edin et al., (2000) which suggest that the relation between earnings and out-migration is dependent on source countries. The results are shown to be robust to adding control variables, changing the wage measure, and use of the parametric model.

Given our findings, estimates of wage assimilation using repeated cross-section data can be downwardly biased for Non-Asian and Japanese immigrants and professional employee immigrants. The assimilation rate is calculated from a sample of all immigrants at the beginning of a period and only the survivors at the end since some fraction of immigrants in a particular cohort are likely to return (Borjas, 2014). As out-migration is not random in terms of wages for these two group and emigrants have relatively high wages, the measured assimilation rate would be biased downward.

The evidence for positive selection in out-migration for professional employees imply suggests a mismatch between Korean immigration policy, which intends to attract and retain highly skilled immigrants, and realities. It is critical to understand why skilled immigrants leave to achieve the policy goal. One possible explanation is that Korea can be considered as intermediary countries to the final destination for

skilled migrants. Migrants may enter Korea, which is likely to be easier to enter, first and use Korea as a stepping stone to their preferred destinations, such as other Asian developed countries or Western countries. Even if skilled migrants did not plan to a third-country destination before coming to Korea, they can move wherever the economic prospects are the highest since their human capital and skills are globally transferable.

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국문초록

이민경제학에 대한 연구논문: 경제적 동화, 노동시장효과, 그리고 선택적 이주

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김혜진

본 연구는 외국인들의 경제적 동화, 이민의 노동시장 효과, 선택적 출국 등 이민경제학에서 중요한 세 가지 주제를 다루고 있다. 법무부와 통계청의 허가를 받아 공공용 데이터보다 더욱 자세한 수준의 자료를 얻어 위의 세 가지 주제에 대한 국내에서 최초로 엄밀한 분석을 시행하였다.

첫 번째 논문은 외국인들의 경제적 동화에 관련된 논문으로 외국인과 내국인 간의 임금격차 변화를 동화의 속도로 정의하였다. 분석결과, 외국인이 한국 노동시장에 처음 진입했을 때는 비슷한 인적자본을 가진

내국인에 비해 15% 정도 낮은 임금을 받지만 체류기간이 1 년 증가할 때마다 0.44%씩 임금 격차가 감소하는 것으로 나타났다. 경제적 동화의 패턴은 성별, 출신국가별로 다르게 나타났다. 남성, 아시아 출신의 경우 전체 분석표본과 유사하게 초기에는 내국인보다 낮은 임금을 받지만 시간이 지나면서 격차가 조금씩 감소하였다. 반면, 비아시아 및 일본 출신과 전문인력은 입국 초기에는 비슷한 교육이나 경력을 가진 내국인보다 임금이 높았지만 시간이 지나면서 상대적 임금이 감소하였다. 여성은 한국 체류기간이 임금에 미치는 영향이 없는 것으로 나타났고 초기 임금격차가 내국인과 차이가 없는 것으로 나타났다.

두 번째 논문은 외국인력 유입이 동일한 인적자본을 가진 내국인의 고용과 임금에 미치는 영향을 분석하였다. 외국인이 내국인의 임금과 고용에 미치는 영향이 전체 표본에 대해서는 통계적으로 유의하게 나타나지 않았지만, 학력별 분석에서는 고졸 미만은 임금 상승률 감소, 대학교육 이상에서는 임금 상승률 증가의 효과가 나타났다. 고졸 미만의 경우 내·외국인의 직업 분포가 매우 유사한 반면 대학교육 이상은 서로 다른 직업군에서 일하기 때문에 이렇게 이질적인 효과가 나타났을 수 있다. 대학교육 이상에 한해 외국인 유입에 대해서 내국인 임금에 대한 효과가 긍정적으로 나타나는 것은 서로 다른 직업군에 종사하여 보완성을 가지기 때문이다.

세 번째 논문은 행정자료와 서베이자료를 연결하여 외국인에 영향을 줄 수 있는 요인들에 대해서 분석하였다. 특히, 한국에서 받는 임금에 집중하여 분석하였는데 전체 분석표본에 대해서는 임금이 출국확률에 미치는 영향이 통계적으로 유의하지 않았다. 출신국가별, 체류자격별 분석을 통해서 이 결과에 대한 상당한 이질성이 발견되었는데 비아시아 및 일본과 전문인력의 경우 임금이 높은 외국인이 출국할 확률이 높았고 나머지는 전체 표본과 동일하게 임금이 미치는 영향이 발견되지 않았다.

주요어: 이민, 동화, 다운그레이딩, 임금, 고용, 직업적 분리, 출국, 선택

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